LIVESTOCK IN THE SOVIET UNION

REPORT OF A TECHNICAL STUDY GROUP

Agricultural Research Service

UNITED STATES DEPARTMENT OF AGRICULTURE

Foreword

An Agreement, concluded on January 27, 1958, between the Governments of the United States of America and the Union of Soviet Socialist Republics, provided for exchanges in the cultural, technical, and educational fields during 1958 and 1959. This Agreement is regarded as a significant first step in the improvement of mutual understanding between the peoples of the two countries.

Agriculture, which is essential to the national economies of the two countries, was specifically included in the Agreement as a field for exchange of specialists. The U.S. Department of Agriculture accordingly sent to the Soviet Union in 1958 six technical study groups of specialists in the following subjects: Agricultural Economics; Agricultural Crops; Soils and Water Use; Veterinary Science; Mechanization of Agriculture; and Cotton Growing and Plant Physiology. In 1959 three additional study groups were sent to the Soviet Union in the following fields: Biological Control of Agricultural Pests; Animal Husbandry; and Forestry, Lumbering, and Millwork.

The Soviet Union in turn sent to the United States in 1958 six delegations of specialists in the following subjects: Farm Mechanization; Hydroengineering (Irrigation) and Reclamation; Animal Husbandry; Cotton Growing; Agricultural Construction and Electrification; and Veterinary Science. In 1959 three additional Soviet groups visited the United States in the following fields: Forestry, Lumbering, and Millwork; Mixed Feeds; and Horticulture.

Each United States exchange study group, on completion of its assignment, prepared a report for publication. Livestock in the Soviet Union is the report of the animal husbandry exchange group and was prepared by Ralph E. Hodgson (group leader), Wesley Keller, and Clair E. Terrill, Agricultural Research Service, United States Department of Agriculture; and Lester E. Hanson, University of Minnesota; Edwin E. Heizer, University of Wisconsin; Andrew V. Nalbandov, University of Illinois; and A. D. Tillman, Oklahoma State University.

GUSTAVE BURMEISTER,
Assistant Administrator,
Agricultural Trade Policy and Analysis,
Foreign Agricultural Service.

Growth Through Agricultural Progress

Contents

	Page
Introduction	1
Collective and state farms	4
Education related to livestock production	8
Livestock research institutions	13
Cattle production	16
Milk processing and marketing	28
Sheep and goat production	31
Swine production	42
Poultry production	48
Pasture and forages	51
Feeding and nutrition research	59
Artificial insemination	63
Physiological research	65
Summary	70
Appendix	73
Itinerary	73
Statistics on livestock and livestock products	75
Account of meeting with Latvian Minister of Agriculture	79
Account of meeting with Ukrainian Vice Minister of Agriculture	80
Description of visits to collective and state farms	82

Washington, D.C. Issued September 1961

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington 25, D.C. - Price 50 cents

LIVESTOCK IN THE SOVIET UNION

Report of a Technical Study Group

Introduction

The animal husbandry technical study group that visited the Soviet Union in the summer of 1959 was made up of seven specialists—three from the United States Department of Agriculture and four from the Land-Grant State Universities. These specialists represented the dairy cattle, beef cattle, sheep, and swine departments. In addition, they represented the subject-matter areas of breeding, feeding and nutrition, management, physiology, and pasture and range management.

The purpose of this group was to exchange views and ideas with counterpart specialists in the Soviet Union; to learn as much as possible of the current status of, and the progress being made in, animal husbandry research and livestock farming; and to bring back any information and ideas that might be useful to livestock farming in the United States. To accomplish this objective the study group looked into the research and educational aspects of livestock production and inspected the kind and quality of the various breeds and types of livestock, and the livestock production practices on numerous experiment stations, and state and collective farms. The group exchanged ideas and views with research workers and livestock specialists at the All-Union Ministry and several of the Republic Ministries of Agriculture, at agricultural academies and animal husbandry research stations, and at state and collective farms.

For the convenience of the reader, all figures are given in American units. Conversion factors used are: 1 kilogram, 2.2 pounds; 1 liter, 1.05 quarts; 1 centimeter, 0.39 inch; 1 centner, 220 pounds; 1 kilometer, 0.6 mile; 1 hectare, 2.47 acres; 1 square kilometer, 0.386 square mile; 1 ton, 2,200 pounds; and 10 rubles, 1 dollar (the current Intourist exchange rate).

The group arrived in Moscow on August 5, 1959. They had a prearranged itinerary that would take them into the important livestock producing areas in the Soviet Union. The study tour covered all classes of livestock and called for a 33-day stay in that country.

The first meeting with officials of the All-Union Ministry of Agriculture was to discuss and agree on an itinerary. The group was assigned an interpreter, Miss Ludmilla Koodinova, a representative of the Ministry of Agriculture, and a guide, Aleksei Vsjakich, Professor of Animal Breeding, Moscow Veterinary Academy.

The itinerary resulted in visits with 2 vice governors of departments of the Russian S.S.R., Ministries of Agriculture of the Latvian S.S.R., and Ukranian S.S.R., 15 agricultural academies and animal husbandry research institutions, 7 state farms operated by academies and institutions, a large dairy plant, and 15 state and collective farms. In addition, the Agricultural Departments of the All-Union and the Ukranian S.S.R. Permanent Exhibitions at Moscow and Kiev were visited. Figure 1 shows the extent of the tour, which comprised about 10,000 miles, and the itinerary in the appendix gives the locations visited. The group felt that they had a good opportunity to observe a cross section of the research and educational activities in animal husbandry and that they saw a representative sample of the best of the breeds and classes of livestock and the practices on experiment stations and state and collective farms in the important livestock production areas in the Soviet Union. Places left out of the original itinerary were Buryat Mongol A.S.S.R., Kirgiz S.S.R., Uzbek S.S.R., and Georgia S.S.R.

The study group was warmly received and was treated with every kindness and considera

Geagraphic Reglans

1. Narthern
2. Baltlc and Western
3. Ukrane-Maldavian
4. Narthern Caucasus
5. Geargian, Armenian, Azerbaijan Republics
6. Valga
7. Central
8. Ural
9. Western Slberia
10. Kazakstan, Turkistan, Uzbek, Kergiz and Tidzhik Republics
11. Central Siberia
12. Eastern

Cities and Areas Visited

A - Mascaw, RSFSR
B - Leningrad, RSFSR
C - Riga - Latvian SSR
D - Kiev - Ukranian SSR
E - Kharkav - Ukranian SSR
F - Askaniya Nava - Ukranian SSR
G - Crimea ASSR
H - Stavropal - RSFSR
I - Alma Ata - Kazak SSR
J - Rubtsavsk - RSFSR

FIGURE 1.—Cities, areas, and geographical regions visited by the animal husbandry study group.

tion throughout their journeys. The Head, Division of International Cooperation, A. F. Karchenko, and his assistants and other representatives of the Ministry of Agriculture in Moscow who received and accompanied the group in the various departments and republics, as well as representatives of the local ministries, gave them every consideration in trying to show them what they desired to see and in providing for their comfort and entertainment. The chairmen and technicians on state and collective farms responded fully to questions and were eager to show what they were doing. The local people invariably turned out to greet them, to cheer them, to see what they looked like, and to display friendship.

In general, it is believed the group observed what there was to see. In some instances, particularly at research institutions, lack of time, absence of a specialist on vacation, or other reasons prevented the group from seeing some laboratories or items of research. The language barrier makes full exchange of ideas and understanding difficult. While the group's interpreter was good, she lacked understanding of technical terms and a thorough knowledge of the subject. This was offset by the fact that one of the team members had an excellent speaking knowledge of Russian. This proved to be a great help in many ways, but particularly in technical discussions.

The American Embassy, Moscow, rendered every assistance to the group. Steven Washenko of the Agricultural Attache's office at-

tended all meetings with the Ministry of Agriculture and accompanied the group on the entire trip.

At the final sessions in the All-Union Ministry of Agriculture, Vice Minister of Agriculture E. M. Checkmenev, who was Chairman of the U.S.S.R. livestock team that visited the United States in 1958, showed the group three excellent moving pictures made from film taken while that team was in the United States. The group also had a summary session with the Vice Minister and some 20 leading livestock specialists from the Ministry and the various academies and institutes in Moscow, at which time they were given the opportunity to ask any questions needed to round out their information.

One of the difficulties on this study tour was to obtain the correct name, title, and position of the people the group met and visited with. This was particularly true at the academies and research institutes. The difficult spelling of names and the group's inability to understand Russian letters and words added to this problem.

Throughout the trip, repeated requests were made to the guide for a list of names, titles, and positions of the people who discussed their work at each stop, but these requests were only partially successful. A final request for this information at the end of the tour resulted in assurance from the guide that the information would be provided, but it was not. For this reason, the list of names in the itinerary included in the appendix is incomplete.

Collective and State Farms

Russian agriculture is organized into about 6,000 state and 60,000 collective farms, which were first organized in the 1930's by obligatory consolidation of the holdings of more than 20 million independent peasant farmers. There were many more collective farms in the 1940's and 1950's, but the numbers have been reduced by consolidation into larger farms and the formation of and increase in the number of state farms. When collectivization of the farms took place, the peasant owners were allowed to keep small plots (about 1 to 2 acres) where they could have their homes and grow garden crops and maintain a few privately owned animals.

The members of the collective have a residual claim to the income of the collective, based on the kind and amount of work they perform. However, the Soviet State controls the collectives and has a prior claim to its share, which may be half or more of the produce of the collective. In contrast, the state farms are owned and managed by the state and the workers are paid wages. From 95 to 97 percent of the 480 million acres of land in crops is under control of the state and collective farms, the remainder being taken up by private garden-plot homesite holdings. Even so, the peasants living on these small privately owned holdings account for a significant part of the livestock production. According to the Vice Minister of Agriculture, over half of the milk production, and about 40 percent of the meat, presently comes from privately owned livestock. The private sector owns about 40 percent of the cattle, one-third of the hogs, and one-fourth of the sheep and goats.

The animal husbandry study group visited 15 state and collective farms in the Soviet Union. These farms were in the important agricultural regions. They are listed in the itinerary in the appendix. A detailed discussion of three of the farms, as related to us by the Chairmen, is also given in the appendix.

All of the farms visited carried on major livestock enterprises, but with few exceptions they were in no way confined to livestock production. Usually cattle, pigs and/or sheep were major livestock enterprises. Chickens often were important. Production of feed crops such as forage, corn, and other feed grains, the growing of wheat, sunflowers, and sugar beets, where they could be grown, also were major enterprises. Potatoes and other vegetable crops and orchard crops were also commonly grown. Occasionally specialty enterprises such as fur farming were found. Since the farms were very large, the numbers of animals in herds and flocks were also large according to our standards.

Each farm is under the supervision of a chairman—on the state farms appointed by the state, and on the collective farms elected by the farm membership. The Chairman must meet the approval of the state and he can be removed by the state. On some collective farms, a committee of several individuals chosen by the members serves with the Chairman in planning the farm program and activities. In this planning, full consideration must be given to the quotas for the farm assigned by the Ministry of Agriculture. This applies to both the kind and the amount of various crops and products assigned to the farm to produce.

Each collective and state farm employs a staff of technicians—usually college graduates —to advise, direct, and supervise the production methods and practices. Depending on the size and variety of enterprises, these may include one or several agronomists, zootechnicians, veterinarians, soils specialists, horticulturists, etc. These people are depended on for professional advice and with the Chairman

Production goals charts—Land of the Soviets Collective Farm, Rubtsovsk.

Production goal for wheat—City Park, Kharkov.

are the key liaison between the farm and the Ministry officials and the institutes. They are similar to our county agents, except that they are more specialized and confine their efforts to a particular farm. This arrangement could make for very rapid adoption on the farm of new varieties and breeds and improved production methods and practices developed in the research laboratories. On listening to these men and women (many are women) and visiting with them and the Chairmen about their work, we were impressed with their sincerity and competence.

The farm work is organized according to enterprises, such as caring for cattle, pigs, or chickens, growing field crops, and gardening. The workers are organized into brigades with a leader at the head of each. Workers, both men and women, have some choice in the kind of work they do. Children also work in various capacities on the farms. The pay depends on the job classification and the work-output in comparison to the work norms established by the management, provision being made for additional pay for work performed above the work norm. This appears to be a great incentive for extra effort and apparently is important to the farm organization in meeting its production goals. In addition, a system of recognition for outstanding performance is designed to promote high achievement. This includes the top gold star medal award given by the central government, for which many workers aspire.

Payment for work on collective farms is in either produce or wages, and on state farms in wages. Wages are low according to American standards. While pay varies according to kind and amount of work on a particular farm, it also varies for the same work from farm to farm and from region to region. Average workers earn from $40 to $110 per month. In many families the man and his wife and the older children all work.

The facilities on most farms left much to be desired. Varying degrees of modernization were evident. Building materials were limited. Much construction was the mud-block adobe type. Housing for cattle probably was better than for other classes of livestock. Most barns had good concrete floors, gutters, and mangers;

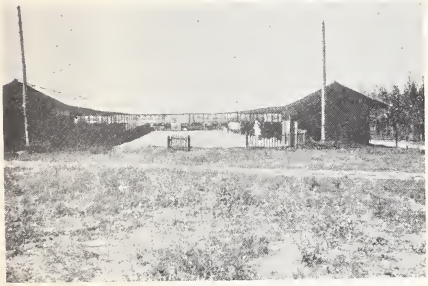
Dwelling house under construction near Askaniya Nova.

New dwelling houses on a collective farm near Kiev.

wood or metal stanchions; and many had water cups. Some had wooden-paddle barn cleaners, others had litter carriers on tracks. Milking by machine was observed more often than hand milking. In the southern areas, the usual practice is to feed and milk the cows in open-sided barns in summer. In winter they are moved to enclosed barns.

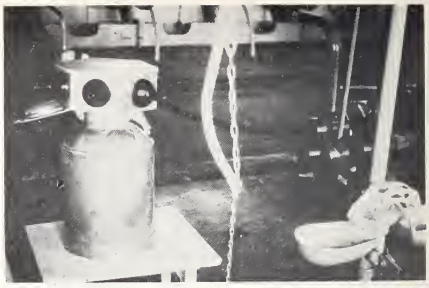
Many barns had a clean, neat appearance. They were smooth-walled, and the walls and ceilings were whitewashed. The barns seldom exceeded 100-cow units in size, and several barns may be dispersed over the farm. Upright silos were few in number, and they were for the most part low in height and large in diameter, and constructed of either wood or brick. Trench and bunker silos are used extensively.

Housing for hogs and chickens generally fits the same pattern as housing for cattle. On some farms hog and chicken houses were modern while on others they were ordinary. Feed preparation facilities were not as adequate and modern as on most American farms.

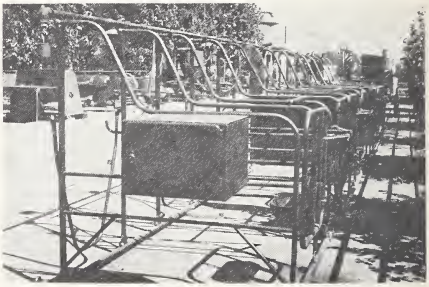


Dairy barn—Michurin Collective Farm, Alma Ata, Kazakhstan.

Milking operation, Ala Tau Cows—Michurin Collective Farm, Alma Ata, Kazakhstan.



Calf feeder, stanchion yoke, watering cups, and milking machine vacuum pump on display in dairy barn —All-Union Permanent Exhibition, Moscow.



Modern portable milking machine equipped cow stanchions on display—All-Union Permanent Exhibition, Moscow.

The practice of cooking feeds and mixing green feeds in pig and chicken rations is very common. One collective had a very modern laying house for 20,000 birds with individual metal cages and automatic feeding and cleaning facilities. Feed preparation facilities likewise were good. The shelters for sheep appeared to be adequate.

There seemed to be a general lack of careful planning in the arrangements of buildings. The group was often left with the impression that a new barn or some other building was put up without respect to ease of servicing, relation to other buildings or fields.

Few farms had sheds for machinery. This might be because only recently could the individual farms own their own equipment. With the closing of the centralized tractor, truck, and machine stations, the state and collective farms acquired their own equipment. The Chairmen proudly recited to the group the number of tractors, trucks, combines, and other machines the farms owned. The machinery for

general crop production was reasonably adequate, especially for grain production. There was little modern forage harvesting equipment except for corn field choppers. The machinery appeared heavy, of standard sizes, and lacking in power. Many tractors were the caterpillar type. There was not the diversity nor the flexibility in machinery that is customary on American farms.

Grain production is pretty well mechanized. However, much of the haymaking and stacking of straw following combine harvesting is handwork. Also, much of the work in the beet fields and potato and other vegetable fields is handwork.

In spite of mechanization, many people were engaged in work of one kind or another that the machine should have replaced. Likewise, the number of people engaged in caring for the animals was very large according to our standards. Labor was not used very efficiently. This probably accounts for the fact that around 50 percent of the population is engaged in agriculture.

A large percentage of the farm working force is made up of women and girls. This is especially true with cattle, pig, and chicken raising. Women appear to like animals and take detailed care of them. The men assume the managerial jobs and, of course, work with the machinery. The people we saw were not lackadaisical about their jobs but were hard working and industrious.

Practically all of the livestock feed is produced on the farm. In the more humid Baltic republics, grazing of pasture is the main source of feed in summer. In the drier southern and eastern areas, major reliance for summer feed is on annual grains, grasses, and legumes, such as wheat, oats, rye, sudan grass, vetch, sweet clover, and corn cut and fed green as forage. Hay for winter use is made of grasses, grass and clover mixtures, clovers, and alfalfa where it can be grown. Hay is scarce and is fed sparsely in winter. Straw is conserved after combine harvesting in huge, carefully constructed stacks and used as feed and bedding for livestock in the winter.

Corn is grown for use as green chopped feed in late summer and as silage in winter. Great effort is being made to increase corn production, especially for fodder for livestock. The corn on most collective farms is the fodder variety, especially in the northern latitudes where it is difficult to mature as grain. Corn for silage is cut at an earlier stage of maturity than it is in the United States. The reason given for this is that they need to get as much protein as possible in the corn fodder because of the protein shortage.

Dairy maids—Land of the Soviets Collective Farm, New Lands Region, Rubtsovsk.

Milk receiving station, cans, strainer, and recording table—Bolsheviki Collective Farm, Kharkov.

It was the usual practice on the farms to feed supplemental concentrates made up of corn grain, oats or barley, mill feed and linseed, sunflower seed or cottonseed meal (depending on availability). Beet pulp, dry or wet, and molasses and beet-top silage are used in areas where sugar beets are grown. The best estimate was that concentrates were fed at the rate of about 1 pound for every 4 pounds of milk, which is about the same as our standards.

Sheep are kept on pastures, which are regularly supplemented with other forage and grain mixtures. In addition to grain mixtures, pigs are fed a lot of skim milk, refuse (garbage, etc.), potatoes, green feed, and pasturage.

On many farms reference was made to the use of crop rotations; usually they were long-term rotations. Fields were very large, and because of the size of fields, enterprises, and farms themselves, feeds had to be moved by truck or animal-drawn vehicles long distances to get them to storage or to feeding barns and areas where used. This appeared to be an important penalty that had to be paid for the price of bigness.

Education Related to Livestock Production

The animal husbandry technical study group was told that there are 100 academies or agricultural colleges in the U.S.S.R. Some of these are All-Union Academies; many are various type Republic Colleges. At most academies, the instructional program is combined with research; students in advanced classes and in post-graduate study carry on research as part of their training program. While the programs of all these academies are coordinated by the central educational body, they apparently are administered separately and each has its own faculty.

The study group visited three academies: (1) Timiryazev Agricultural Academy near Moscow; (2) Pushkin Academy and Laboratory for Animal Multiplication, near Leningrad; and (3) Agricultural Academy of Stavropol, Stavropol Department. The group was interested in learning as much as possible of the college training program for animal husbandry at these academies. A brief description of the program, as told by the director of each of these institutions, follows.

Timiryazev Agricultural Academy

This academy is the oldest (founded in 1865) and, as it is All-Union, it is the highest ranking agricultural school in the U.S.S.R. The academy has five basic faculties—agronomy, animal husbandry, fruit and vegetable growing, soil science and agricultural chemistry, and economics. Theoretical and practical education in general science and special subjects related to agriculture is entrusted to 55 chairs and over 500 faculty members. The staff includes professional chairs, associate and assistant professors, and junior scientists.

The academy supports a number of experimental stations and laboratories where students carry on much of their work in experimental and practical training. These are: Field Husbandry Experimental Station; Lisitsyn Selection and Genetics Station; Willians Station of Soil Science and Agronomy; Experimental Training Dairy Farm; Vegetable Growing Experimental Station; Fruit Growing Experimental Station; Pryanishnikov Experimental Station of Agronomical Chemistry; Experimental Forestry Station; Experimental

Administration Building, Timiryazev Academy of Agricultural Sciences, University of Moscow.

Station for Plant Protection; Floriculture Experimental Station; Artificial Climate Laboratory; Biophysical Laboratory; Laboratory of Chemical Plant Protection; Laboratory of Economic Research; Mikhelson Meterological Observatory; Experimental Training Stable; Experimental Dairy Plant; and Experimental Apiary. There are eight experimental museums at the academy. There is also a plant and animal experimental laboratory for study of application of atomic energy to biology. The animal laboratory is just being built.

The faculty for animal husbandry consists of the following chairs (or sections) under the direction of Doctor of Science Professor T. E. Burdelev: (1) Anatomy of Farm Animals and Histology; (2) Zoology; (3) Zoological Hygiene and Veterinary Service; (4) Horse Breeding; (5) Livestock Fodder; (6) Cattle Breeding; (7) Sheep Breeding; (8) Poultry Breeding; (9) Fishpond Culture; (10) Beekeeping; (11) Breeding Farm Animals; (12) Pig Breeding; and (13) Physiology of Farm Animals.

The academy receives a budget from the Ministry of Agriculture equivalent to $5.4 million. They also have a farm income of $500,000 to $600,000, half of which is used for capital improvement.

The academy operates 6 farms in the vicinity of Moscow and several farms in different parts of the Soviet Union. Thus the experimental

Moscow Agricultural Academy Named in Honor of K. A. Timiryazev

Excerpt from the Study Plan for students specializing in *Zootechnology (Animal Husbandry)*[1]

For the Degree "Diplom Zootechnik", Over a Study Period of 4 Years 10 Months
(As approved by the Rector, 9 July 1956)

Disciplines	Hours of instruction				
	Total	Lectures	Laboratory work	Practical work, seminars, exercises	Course projects, summer work
	Number	*Number*	*Number*	*Number*	*Number*
1. Hist. of Com. Party of U.S.S.R.	160	100		60	
2. Political Economy	160	100		60	
3. Dialectical Materialism	70	50		20	
4. Foreign Language	130			130	
5. Basic Higher Mathematics	70	40		30	
6. Meteorological Physics	170	70	100		
7. Inorgan. & Analyt. Chem.	200	60	140		
8. Organic Chemistry	120	60	60		
9. Bio. Chem. with Prin. of Phys. & Colloidal Chemistry	140	70	70		
10. Anatomy, Histology & Embryology	200	70	130		
11. Darwinism	40	40			
12. Botany	100	40	50		10
13. Zoology	100	40	50		10
14. Microbiology	100	50	40		10
15. Livestock Physiology	200	100	100		
16. Mech. & Elec. of Agr.	200	70	100		30
17. Agron., Agr. with Prin. of Soil Science: Plant Breeding	90	30	40		20
	110	40	50		20
18. Pasture Cultivation	120	40	50		30
19. Lvstk. Breed. & Prin. of Genetics	200	80	100		20
20. Livestock Feeding & Analyses	200	90	100		10
21. Zoohygiene	100	40	50		10
22. Veterinary Principles	120	60	60		
23. Obstet. & Artificial Insemination	100	40	50		10
24. Divisions of Zootechnology					
a. Longhorned Cattle	130	60	50		20
b. Horse Breeding	100	40	40		20
c. Sheep Breeding	100	50	50		
d. Swine Breeding	90	40	50		
e. Poultry Breeding	70	30	40		
25. Fishpond Cultures	60	20	20		20
26. Apiculture	30	10		20	
27. Dairy Farming	100	40	50		10
28. Org. of Soc. Agr. Enterprises	170	80		70	20
29. Econ. Plan. of Soc. Agr.	90	60		30	
30. Statistical, Bookkeeping and Accounting	80	40		40	
31. Agricultural Buildings	30	10		20	
32. Special Training	450			450	
33. Phys. Ed. and Sports	130			120	10
34. Local Antiaircraft Defense	50			50	
Total	4,880	1,860	1,640	1,100	280

[1] This curriculum was prepared and furnished for this report by Prof. P. M. Raup, Department of Agricultural Economics, University of Minnesota, St. Paul, Minn. It is an approximate translation of the study plan current for the year 1958–59 obtained by Professor Raup when he visited the Timiryazev Academy in 1958.

University of Moscow.

and teaching activities are national in scope and concern themselves with nationwide problems.

The course of study for the first diploma is 5 years; for M.S. it is 3 additional years plus the defense of a thesis based on the student's own research. Under general guidance of a major professor, the student works independently toward a doctor's degree while on the job, plus the defense of a thesis based on this difficult research. The research he undertakes is closely related to Central Soviet Union objectives. The objective is to train people for pursuits in the broad fields of agriculture, such as technicians in the Ministries of Agriculture, agricultural teachers, research workers, and technicians for state and collective farms.

The first 2 years of study are devoted mainly to theoretical training in basic science courses and the last 3 to specialized training in the area of their major interest. Before graduating, students receive training in 30 to 35 different subjects. A list of courses for the animal husbandry curriculum is given on page 9.

The last 3 years are spent largely in practical training and doing research of their own under supervision of their instructor, either at the central academy farms or at outlying state or collective farms. After 4 years of training, the student writes a paper on a subject in his field; this may be a literature review or a dissertation of original research. Much emphasis apparently is given in the training period to practical on-the-farm experience, this type of activity being emphasized during the spring and summer while class work at the academy is emphasized in the winter. Upper classmen and, of course, graduate students are encouraged and required to carry on experimentation as an important extension of their training. This phase of the training is fostered by the faculty and encouraged by a voluntary students' scientific society of the academy, of which there are about 1,500 student members. Through meetings and various other programs, the student member participates in an organized way in discussions and activities in a scientific climate. Emphasis is placed also upon recreation, physical development, and social activities among the student body.

The academy gives numerous types of special short courses, such as refresher courses for graduates and special short courses for state and collective farm managers and specialized workers.

The student body consists of over 3,000 students who come from all republics and from a number of satellite and foreign countries. Three hundred students are working for advanced degrees.

Any student who desires to attend the academy may apply for entry. An entrance examination, based largely on competence in literature, physics, mathematics, and chemistry, is required. The higher ranking students are admitted. Each department or faculty is limited to 500, and the best students are given scholarships. About 80 percent of the entering students are farm-raised and about 92 percent of the students receive scholarships. The base scholarships are for $30 per month the first year, $35 the second year, $40 the third year, $45 the fourth, and $50 the fifth year. For top-ranking students, 25 percent is added up to a ceiling of $70. About 95 percent of the students who gain entrance complete their courses. Approximately 60 percent of the students are males and 40 percent females. Each student pays $15 per month to the academy for living expenses.

Pushkin Academy and Laboratory for Animal Multiplication

This academy, established in 1904, is one of the oldest in the Soviet Union. It is a Regional Agricultural College, which deals with nonblack soil or northern U.S.S.R. agriculture. It also carries on research programs in conjunction with student instruction. Agronomy, animal husbandry, economics, and farm management, plant production, vegetables and gardening, and engineering make up the six faculties of this academy. While the Timiryazev Academy is the center of methodology and superior to the Pushkin Academy, the curriculum of the two is about the same. There are 6 professorial chairs and 40 other professorships. The technical staff numbers 350 and includes many distinguished scientists.

The enrollment was 6,000; one-half were in

residence and one-half were nonresident. The latter group study by supervised correspondence courses and come to the academy once a year for examinations. The curriculum is a 5-year course with about half the time spent in classroom instruction and half in practical field and experimental work. Students are required to have 1 or 2 years of practical experience before taking up graduate study. About 725 students are training for advanced degrees. Their training prepares students for agricultural pursuits in the ministries of agriculture, and as teachers, researchers, or specialists on state and collective farms, mainly in the northern region. Nearly 95 percent of the students have scholarships obtained on the basis of superior achievement.

Students participate freely in academy programs of research, building and construction and related activities. Like Timiryazev, Pushkin places great emphasis on sports, cultural development, and social development. For example, the group was told that there were 22 sport sections for students to participate in at this academy.

Agricultural Academy of Stavropol

This academy was established 26 years ago. It engages in both teaching and research. The academy staff consists of 208 teachers and research workers. It has chairs in agriculture, agricultural economics, agronomy, animal husbandry, and veterinary science. The student body was about 2,200, of which 1,800 were enrolled in short courses and special extension-type courses. The in-residence course is 5 years and is organized much as are those of the Timiryazev and Pushkin Academies.

Practical Training Emphasized

In the short time available it was difficult for the group to get a clear picture of the total educational effort in agriculture and specifically in animal husbandry. The students on the average are older than ours and many more women train in agriculture and animal husbandry than do in the United States. The Soviets are placing great emphasis on advanced education as a means to advance their agricultural and livestock industries. Their course of study emphasizes practical experience, particularly on-the-farm experience during the last 3 years of college. One wonders how closely the teacher supervises and whether or not much student labor is actually used to produce the crops and livestock on experiment station and state and collective farms. On the other hand, students entering college may have more training in science and take more basic science courses during the first 2 years of college than do students in many United States colleges.

Central pavilion—All-Union Permanent Exhibition, Moscow.

Barns and laboratory buildings—Academy of Genetics, Experimental Base of Vasknil, Gorky Farm.

It is not known how many graduates become available each year to take up pursuits in agriculture, but the figure must be impressive. For instance, the Latvian Minister of Agriculture indicated that the Latvian Academy, comprising 9 faculties and 21 technical schools and other academies, has trained 12,000 specialists now in service in that republic. In the Ukrainian Republic the Vice Minister stated that there are 22 agricultural colleges and 120 technical agricultural schools for training agricultural technicians. In the latter, students come from the grade school (8th grade graduates), study 4 years, and then work on collective farms 5 years.

Adult Education

The academies place considerable importance on extension-type education and short courses as a way of extending technical education in

agriculture to greater numbers of people. Short courses are designed to serve state and collective farm managers, technicians on the staffs of these farms, and farm workers. The agricultural departments of both the Moscow Permanent Exhibition and the Ukrainian Permanent Exhibition, Kiev, regularly give short courses and demonstrations of advanced agricultural practices for people in various agricultural pursuits.

The great attention given to agricultural education is further evidenced by the existence of many books and magazines relating to agriculture. Many are authored by teachers and scientists of the academies, and the academies themselves publish many reports.

The Russian system does not have an agricultural extension service as we know it. However, many specialists on the staff of the All-Union Ministry and the various Republic Ministries of Agriculture serve at least in part in extension education. In addition, each state and collective farm has a staff of trained specialists, such as agronomists, zootechnicians, and veterinarians, who serve as farm advisers on the particular farm. There is a very close supervision and coordination all up and down the line from the central ministry to the farm worker. This controlled system can serve to put new findings into practice quickly. It is suspected that these personnel give considerable attention to seeing that the directives from the Ministry are carried out and that production quotas are achieved. Perhaps the emphasis is more on direction than on education in the U.S.S.R. as compared with the United States.

Chairman Nerovny (left) and technicians at headquarters—Bolsheviki Collective Farm, Kharkov.

Dr. T. D. Lysenko lecturing to animal husbandry study group—Experimental Base of Vasknil, Gorky.

Livestock Research Institutions

The Academy of Agricultural Science, the top agricultural research body in the U.S.S.R., is a branch of the All-Union Academy of Sciences. The republics also have agricultural science academies, which are subordinated to the All-Union Academy. The All-Union Ministry of Agriculture and the various Republic Ministries support and operate the agricultural research institutes, academies, experiment stations, and farms.

The numerous stations appear to be tied together, their programs being coordinated by the All-Union and republic academies of agricultural science and Ministries of Agriculture. The appropriated funds are administered by the Ministries of Agriculture, and it is possible that the programs are developed by the central planning bodies of the All-Union Ministry of Agriculture and Academy of Agricultural Sciences.

Animal husbandry research is conducted in a number of different types of organizations. The academies—for example, the Timiryazev Academy—conduct research in addition to instruction. Also, many of the All-Union and republic agricultural research institutes, such as Askaniya Nova Research Institute, include animal husbandry research in their overall agricultural program. Some institutes, such as the Animal Husbandry Research Institute in Moscow, conduct animal husbandry research exclusively. Finally, some conduct research on only one class of animals; for example, the Research Institute for Sheep and Goat Breeding at Stavropol.

The research institutes appear to be well staffed. The directors and senior staff members of the academies and institutes were competent and well-informed individuals. Some were academicians or corresponding academicians in the All-Union Academy of Agricultural Science, a recognition held in highest regard and one most sought after as a mark of achievement in Soviet scientific and social circles. The senior staffs are well supported by associate and junior scientists. Research workers carry high standing and are comparatively well paid. Most of them have or are working to obtain a higher degree from one of the principal agricultural academies.

The research institute generally operates a state farm on which its facilities are located. In addition, it may operate one or more outlying state farms and frequently one or more artificial insemination studs as a part of the research program. The various institutes usually conduct a pedigree herdbook program for one or more breeds of livestock to develop and extend the breeds in the region. The research institutes or academies are responsible for developing new and improved breeds of livestock especially adapted to a particular region as well as for continuing the multiplication and improvement of these breeds.

The buildings in which the various academies and institutes were housed for the most part were not impressive. Even the newly established and reconstructed buildings did not appear to be expansive or efficiently arranged or adequate. Likewise, the housing for experimental animals and the equipment in barns left much to be desired. There was evidence of mechanization, but in some cases it was primitive. There was no lack of personnel to care for the experimental crops and animals.

The laboratory equipment seemed to be adequate for the jobs, but much of it appeared to be heavy and crude. Even though much of the apparatus had a "homemade" appearance, there was enough equipment for conducting the latest biological procedures used in animal research. The Timiryazev laboratory for the study of the application of atomic energy to biology had most of the different kinds of electronic equipment necessary for research in this field. Although they were unable to do liquid scintillation counting, this was the most advanced laboratory observed on the tour.

Evidence of wide usage of statistical procedure was lacking. Calculating machines were old models and of small capacity, and there was no evidence that data were being processed by electronic computers. The abacus appeared to be the main aid for making calculations.

It was difficult to obtain a clear idea of the total animal husbandry research program of a particular research institute. The language barrier and our inability to comprehend adequately their way of doing things undoubtedly were factors. However, the Soviets have a large and expanding research program, which

includes both basic and applied research. It appeared at first that a very large share of the effort was devoted to livestock breeding. The group later formed the opinion that the term livestock breeding to the Russian closely coincides with our term livestock production and includes more than just breeding investigations. A great amount of research is directed toward developing new breeds and improving presently available breeds and strains of the various classes of livestock and poultry. In general, however, the group felt that a fairly accurate impression was obtained of the research program in livestock. Phases of the research will be dealt with more specifically in other sections of this report.

Much of the animal breeding program is based on the Michurin theory, as presently propounded by T. D. Lysenko. It is likely that this program has been made easier to explain by the conditions existing since the conclusion of the war. There has been a constant and steady improvement in feeding, management, and other environmental conditions surrounding the keeping of livestock. The group saw little evidence in experimental breeding research of control populations that would serve as a bench mark for measuring genetic progress. Data to substantiate statements and claims made by animal breeders were difficult to obtain. At a number of institutes they were establishing inbred lines of cattle, sheep, swine, and poultry for making line crosses.

Askaniya Nova Agricultural Research Institute—M. P. Ivanov, Southern Ukraine.

Group discussion—Pavlov Institute of Physiology, Kiltushi.

Formation of new breeds seems to be a popular research goal and indications were that it was a comparatively easy and short-time task for a researcher to accomplish this goal. It appeared that by predetermination it was decided which breeds would be best to use in crossing to develop a wanted new breed. It merely remained to obtain the animals, make the foundation crosses, and grade up to the breed of the sire for 2 to 4 generations. Then by crossing the crossbred offspring combined with selections, the new breed adapted to the conditions is made.

In breeding research, investigators have access to large numbers of animals. In addition to those at the experiment station state farms, a researcher has at his complete disposal cattle on other state or collective farms. While the advantages of large numbers of animals are apparent, one wonders how much control the investigator has over other factors that might have an important influence on results.

Laboratories at several institutes are actively engaged in research on artificial insemination. Soviet scientists were pioneers in the application of artificial insemination in livestock breeding, especially in sheep. A Russian scientist, I. V. Smirnov, was the first to produce a live calf with frozen semen. Yet, they have not used frozen semen in the breeding industry to the extent that we have in the West. Considerable research is in progress on techniques of producing and handling frozen semen. Other research deals with investigations to improve diluents, and with methods of using unfrozen semen more efficiently. They are no further along than we are in this research.

Several institutes had active programs in physiology research. Notable among these was the Pavlov Institute of Physiology at Koltushi near Leningrad. At this institute work was in progress on neural physiology and the physiology of lactation. Other physiological work on reproduction, lactation, and rumen function was observed at this institute and at the Pushkin Academy, the Animal Husbandry Research Institute, Kharkov; Ukraine Research Institute

for Poultry, Kharkov; Agricultural College of Stavropol, Stavropol; and the Kazakhstan Academy of Agricultural Science, Alma Ata.

The study group saw relatively little work in nutrition and livestock feeding. This was particularly true of the applied feeding trial research that is popular and important in the United States. Most of the academies and institutes maintained active laboratories for feed analysis. Facilities for basic metabolism research were available in a few places such as the Animal Husbandry Research Institute Experimental Farm at Podolsk; the Kazakhstan Academy of Agricultural Science, Alma Ata; and the Animal Husbandry Research Institute and the Ukrainian Research Institute for Poultry, both at Kharkov. Research on rumen metabolism was in progress at several stations, among them the Agricultural Academy of Stavropol, Stavropol; the Kazakhstan Academy of Agricultural Science, Alma Ata; and the Animal Husbandry Research Institute, Kharkov. The group saw no organized research on pasture and pasture management, and only a little on silage, such as the grass-silage research at the Animal Husbandry Research Institute near Riga, Latvia.

It was most difficult to obtain a very clear idea on the research methods used and the experimental designs and methods for statistical analysis of data. As mentioned earlier, equipment for mechanical calculation of data by modern procedure was not very apparent. On the other hand, laboratory equipment such as electronic equipment for isotope studies, chromatographic equipment, and colorimetric equipment, as well as other standard laboratory equipment, was available in many laboratories. As the group walked through laboratories and talked to specialists, it was apparent that the Soviets were well-acquainted with Western animal husbandry scientific literature, and copies of Western scientific journals were in evidence.

Cattle Production

Cattle Farming

The Soviet Union places great emphasis on developing and expanding cattle raising to increase the supply of milk and meat. There is a passionate desire to surpass the United States in total and per capita production of these products. The study group observed this at all levels of discussion. "Beat America" in milk and meat production is a slogan used to stimulate collective and state farms to greater production of these products. According to the statistics in table 11 (appendix), the per capita production in 1957 was 590 pounds of milk and 79 pounds of meat and lard. This compares with the per capita production for the same year in the United States of 736 pounds of milk and 159.1 pounds of red meat.

The central government has recently directed that greater acreages of land be devoted to growing corn and other feed grains and forage crops to provide the feed supplies to support the expansion of milk and meat production.

Cattle Breeds

The cattle of the Soviet Union are dual purpose, but the major emphasis up to this time has been on milk production. With very few exceptions there are no distinct breeds of beef cattle. In this respect the Russians have followed the same course as their northern European neighbors.

However, efforts are currently being made to develop specialized breeds for meat production. The improvement in feed supplies may account in part for the feeling that specialization can now take place.

The Vice Minister of Agriculture, E. M. Checkmenev, expressed a strong feeling that Soviet livestock producers must specialize. He may have formed this opinion following his visit to the United States in 1958. At some research institutions and state farms, particularly at the Askaniya Nova Animal Husbandry Research Institute, bulls of the Shorthorn, Aberdeen Angus, Santa Gertrudis, and Zebu breeds were being crossed with cows of the Red Steppe and other breeds. The Vice Minister expressed a desire to import breeding animals of the beef breeds from the United States. This has already been done to a limited extent. Recently a commission was in the United States to purchase 300 to 400 head of breeding stock of the several beef breeds.

Milking Herd of Latvian Brown Cattle—Red October Collective Farm, Rouma, Latvia.

A group of privately owned cows of the Red Steppe Breed on native range—Georgia Collective Farm, Genichesk.

Herd of white-faced Ukraine cattle—State Farm of Animal Husbandry Research Institute, Teresino, Ukraine Republic.

There are 28 described breeds of cattle in the Soviet Union. A brief description of each of these breeds, including the principal color markings and the minimum requirements for size and milk production at specific stages of life for admittance to the First Class Registry, is shown in table 1. Only the Kalmitz is classed as a meat breed. In addition, three breeds of Zebu—the Khorosan, the Kuramin, and the Talishin—are recognized. All are varied black and red or spotted in color and presumably used for meat and draft purposes. One breed of black Yak and one breed of black or dark gray or brown Buffalo are also briefly described.

A recent report[1] describes developments in milk production. The essential data in this report are summarized in table 2. These data show a very large increase in total production of cow's milk—62.5 percent from 1940 to 1957. This compares with an increase of 15.1 percent in the United States in the same period. The report suggests serious doubt concerning the validity of the official milk-production figures. It suggests that a more realistic figure for the 1957 production would be about 100 billion pounds rather than the 117.5 billion pounds reported. The report also shows that the numbers of cows had increased by 42.7 percent from 1940 to 1957, while the number of cows and heifers 2 years old and over kept for milk in the United States had decreased by 8 percent.

Average milk production per cow has shown a significant increase to about 4,000 pounds in 1957. Production per cow, as calculated from the data in table 2 by years, is shown in comparison with that of United States cows in figure 2. According to these data, production per cow in the United States from 1940 to 1957 had increased by 36.9 percent, while production per cow in the U.S.S.R. increased 24.8 percent. In the latter case, a very significant increase took place in the year 1955. Previous to that year, and following that year, the year-to-year increase was very small. Perhaps this large increase could be the result of a change in statistical reporting rather than an actual increase in milk production per cow.

There apparently is a great range in production per cow in different areas and on different farms in the U.S.S.R. just as there is in the United States. As an example of this, table 3 shows the average milk yield per cow reported for each state and collective farm the study group visited. Averages for all cows in the Latvian Republic, in the Stavropol Department, and for the collective and state farms in the Ukrainian Republic are also shown. The average for all these is 8,147 pounds, which is more than double the reported U.S.S.R. average.[2] It is apparent that the study group was given the opportunity to see the better producing herds. At the same time, it is not difficult for a visitor to have the same experience on a tour to study dairy farming in the United States.

The study group had little opportunity to observe livestock production practices carried

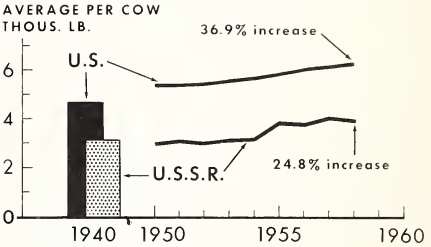


FIGURE 2.—Trends in milk yields per cow in the United States and in the Union of Soviet Socialist Republics. (Data for United States from Agricultural Statistics Series, U.S. Department of Agriculture, Washington, D.C.; data for U.S.S.R. from Milk Production in the Soviet Union, FAS-M-58, U.S. Department of Agriculture, Washington, D.C., 1959. Average yield per cow calculated by dividing figures for all cows, table 3, column 1, into figures for total yield for cows' milk, table 1, column 1.)

on by the private land holders on their 1-acre plots. This was unfortunate because more than half of the milk and 40 percent of the beef come from these private holdings. What they were able to see indicated that conditions were not particularly conducive to high production per animal unit.

Evidently not much attention is given to type, at least nowhere near the attention that is given to it in this country. If there is, the ideas of type are different from ours. The cows are coarse, rough, and often low in the back and rump; and the udders are not well balanced. Individuals of the various breeds lack uniformity, both in color and appearance. There are no breed associations as such. The Ministry of Agriculture and the various institutes are responsible for developing the various breeds. The main emphasis is on utility aspects, such as size and weight for age, and on milk yield and butterfat content.

[1] Milk Production in the Soviet Union—Recent Developments — Volin, Lazar, Foreign Agricultural Service, FAS-M-58, May 1959. U.S. Department of Agriculture, Washington, D.C.

[2] The study group made a number of inquiries concerning the method by which the average production of all cows is computed by various Ministries of Agriculture. They were informed on one occasion that the average production per cow, as measured on collective and state farms, was projected for that part of the cow population privately owned (approximately 53%).

TABLE 1.—*Description of*

Breed	Foundation stock used in origin	Approximate date of origin	Origin and areas of popularity in U.S.S.R.	Type
1. Kolmogora	Native, Friesian	1750	Central, North, West Central.	milk-meat
2. Tagil	Native, Kolmogora, Dutch, Yaroslav.	1760–1800	Middle Urals	do
3. Yaroslav	Native	1850–60	Central, North	do
4. Istobensk	Native, Kolmogora, Swiss, E. Friesian, Yaroslav.	1924–25	North Central	do
5. East Friesian	Imported from Germany	1700	West Central	do
6. Aulieatinsk	Native, Dutch imported	1882–1912	Khirqiz, Kazakh Repub.	do
7. White-faced Ukraine	Native, Dutch imported	1780–1800	Central Ukraine	do
8. Red Steppe	Native, East Friesian	1910–11	Southern Ukraine, Central Asia, So. Central.	do
9. Red Estonian	Native, Red Dane, Swed. Red.	1900	Estonia	do
10. Latvian Brown	Native, Red Dane, Swed. Red.	1860	Latvia, Central U.S.S.R.	do
11. Red Lithuanian	Native, Ayrshire, Swiss, Friesian, Red Dane.		Lithuania	do
12. Blk. Spotted Lith.	Native, Dutch imp., Swiss	1930–35	Lithuania	do
13. Blk. Spotted Estonian	Native, Dutch imported	1900–20	Estonia, North Central U.S.S.R., Northwest U.S.S.R.	do
14. Kostroma	Native, Swiss imported	1917	Central	do
15. Simmental	Imp. from Switzerland	1800	Ukraine, West Central U.S.S.R.	do
16. Sichevski	Native, Simmental	1930	West Central, Central Siberia, White Russia.	do
17. Swiss	Imp. from Switzerland	1862	Central	do
18. Red Humpback	Native, Tyrolean	1860	Central U.S.S.R.	do
19. Kurgan	Native, Shorthorn impor.	1900	Central Urals	do
20. Lebedin	Native, Brown Swiss	1934	Central Ukraine, West Central.	do
21. Ala Tau	Native, Brown Swiss	1900	South Asia Republics	do
22. Bestuzhev	Native, Shorthorn	1850–1900	East Central, Urals	do
23. Yurin	Native, Tyrolean, Swiss	1900	Central U.S.S.R.	do
24. Red Tambov	Native, Tyrolean, Simmental.	1900	Central U.S.S.R.	do
25. Shorthorn	Imported	1900	Central U.S.S.R., Central Urals and Northern Caucasus.	do
26. Kalmitz	Native	1917	Northern Caucasus	meat
27. White-faced Kazakh	Native, Hereford	1930	Caspian, South Asia	meat-milk
28. Grey Ukraine		1910	Ukraine, Kuban	do

[1] From a picture brochure made available by the Ministry of Agriculture.

Russian cattle breeds [1]

Principal color markings	Minimum requirements for admittance to first class registry					
	Live weight		Milk production—300 days			
	Bulls, 5 yrs old and over	Cows at 3d calving	First lactation	Second lactation	Third lactation	Butterfat average
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Percent*
Black, white; red, white, spotted	1,760	1,056	5,060	5,940	6,600	3.7
Black, black spotted, red; red spotted.	1,650	1,012	4,840	5,720	6,380	4.0
Black or red with white, white around face, eyes and underline.	1,584	968	4,620	5,500	6,160	4.0
Black or red and white spotted	1,650	1,012	4,620	5,500	6,160	4.0
Black and white	1,804	1,100	5,720	6,600	7,480	3.6
Black or red spotted	1,584	946	4,620	5,500	6,160	3.8
Black, red or chestnut with white face.	1,650	968	4,884	5,720	6,380	3.7
Red-light to dark	1,650	1,034	5,060	5,940	6,600	3.7
Red	1,650	1,034	5,060	5,940	6,600	3.8
Red, chestnut	1,650	1,034	5,060	5,940	6,600	3.7
Red of varying shades; red spotted.	1,650	1,034	5,060	5,940	6,600	3.7
Black, white spotted	1,804	1,100	5,500	6,380	7,260	3.7
Black spotted	1,804	1,100	5,500	6,380	7,260	3.7
Light or dark grey, brown	1,826	1,122	5,720	6,600	7,480	3.8
Yellow or red spotted	1,804	1,122	5,060	5,940	6,600	3.7
Pale yellow or red spotted	1,848	1,144	5,280	6,160	6,820	3.8
Brown	1,760	1,078	5,280	6,160	6,820	3.7
Red	1,540	946	4,400	5,280	5,940	4.0
Red or red spotted	1,694	1,078	4,840	5,720	6,380	3.9
Grey, brown	1,760	1,100	5,280	6,160	7,040	3.8
Brown	1,760	1,078	5,060	5,940	6,820	3.8
Red, red spotted	1,716	1,056	4,400	5,280	5,940	3.8
Red, brown	1,540	946	4,400	5,280	5,940	4.0
Chestnut, red, red sptd.	1,760	1,100	5,060	5,940	6,600	3.7
Red, white, roan	1,760	1,100	4,400	5,280	5,940	3.8
Red, red spotted	1,650	1,056				
Red with white face	1,640	1,060	3,080	3,740	3,960	3.8
Grey	1,694	1,100	3,300	4,180	4,840	4.1

TABLE 2.—*Total cow numbers and milk production by farming sources in the U.S.S.R. for selected years* [1]

Year	Cow's milk production				Percentage of production coming from—			All cows [3]	Average yield per cow [4]
	Total [2]	Collective farms	State farms	Private sectors	Collective farms	State farms	Private sectors		
	Billion pounds	*Billion pounds*	*Billion pounds*	*Billion pounds*	*Percent*	*Percent*	*Percent*	*No. million*	*Pounds*
1940	72.3	12.0	4.3	56.0	16.6	6.0	77.4	22.8	3173
1950	73.6	14.3	4.5	54.8	19.4	6.2	74.4	24.6	2992
1953	75.5	19.6	6.5	49.5	25.9	8.6	65.5	24.3	3109
1955	90.7	29.6	7.6	53.5	32.7	8.3	59.0	26.4	3810
1957	117.6	43.5	12.1	62.0	37.0	10.2	52.8	29.0	4054

[1] Adopted from tables 1, 2, and 3 FAS–M–58 USDA.
[2] An additional 3 to 4 million pounds of milk are reported as coming from sheep and goats. 1958 production given as 127.4 million pounds of which probably 3 million are from sheep and goats.
[3] Reported as all cows.
[4] Derived by dividing total cow milk production by total of all cows.

TABLE 3.—*Statistics on the average annual milk production per cow on Soviet farms*

Unit	Location	Breed	Milk yield
			Pounds
Latvian Republic (all cows)	Latvia	Latvian Brown	5,500
Ukraine Republic-collective farms	Ukraine	Simmental and W. Faced Ukraine	4,620
Ukraine Republic-state farms	Ukraine	Simmental and W. Faced Ukraine	5,280
Stavropol Department	Stavropol	Red Steppe	5,940
Academy of Science-college herd	Moscow	Kolmogora	13,200
Animal Husbandry Station-state farm	Podolsk	Kolmogora	13,860
Lenin Collective Farm	Gorky	Kolmogora and Friesians	11,000
Genetics Institute-state farm	Gorky	Kostroma	13,200
Red Partisan Collective Farm	Leningrad	Kolmogora and Friesians	8,470
Animal Husbandry Station-state farm	Riga	Latvian Brown	10,660
Red October Collective Farm	Latvia	Latvian Brown	6,600
Livinis Collective Farm	Latvia	Latvian Brown	7,480
Animal Husbandry Station-state farm	Kiev	Simmental	10,000
Animal Husbandry Station-state farm	Kiev	W. Faced Ukraine	8,800
Bolsheviki Collective Farm	Kharkov	Simmental	3,862
Animal Husbandry Station-state farm	Kharkov	Simmental-Line 1	18,260
Animal Husbandry Station-state farm	Kharkov	Simmental-Line 2	12,100
Askaniya Nova Station-state farm	Askaniya Nova	Red Steppe	9,900
Georgia Collective Farm	Genichesk	Red Steppe	3,440
Lenin Collective Farm	Essentucki	Red Steppe	6,200
Ray of East Collective Farm	Alma Ata	Ala Tau	3,182
Ray of East Collective Farm	Alma Ata	Ala Purebreds	11,000
Nichurin Collective Farm	Alma Ata	Ala Tau	6,600
Rubtsovsk State Pedigree Farm	Rubtsovsk	Simmental	2,236
Land of Soviet Collective Farm	Rubtsovsk	Simmental	2,290
Average			8,147

Care and Management

Herds on collective and state farms are large. But the general practice appears to be to divide them into smaller units and to keep milking cows together and away from dry cows and young stock. Barns usually hold about 100 milking cows and there are several such barns on the farm, depending on the size and importance of the cattle enterprise. In the northern areas, enclosed stanchion barns are commonly used the year around, while in the southern areas enclosed barns are used in winter but in summer the cows are often housed in open-sided stanchion barns. These methods appear to be an effort to house producing animals so that adverse climatic factors are minimized. There was no evidence of loose housing and milking parlors.

Pasturing is not practiced extensively. Only in Latvia did the study group observe cattle grazing on pasture. Here intensive rotational grazing on productive permanent pasture, like one might see in the humid areas of the United States, was common. This was about the only place where fences were observed. The practice throughout other parts of the U.S.S.R. is to keep the producing cows in barns the year around and bring the feed to them. Dry stock and heifers are less well cared for than are milking cows; they are pastured and given supplemental feed as needed to keep them in fair condition. These animals are tended by herders, who are most often women.

Cattle barn and silos—Red Partisan Collective Farm, Leningrad.

Members of animal husbandry study group inspecting botanical cover on Steppe Range reserved from grazing—Askaniya Nova Agricultural Experiment Station, Southern Ukraine.

Olga Patursky, interpreter, inspects portable stock watering equipment—Institute of Animal Husbandry and Veterinary Science, Experimental Farm, Riga, Latvia.

The Russians believe in exercising their animals. Those not pastured are driven several miles each day. The group was told by the head of the cattle department of the Timiryazev Academy that exercise improves the cow's ability to digest food and enables her to produce more milk per unit of food. Exercising animals, therefore, appears to be a regular part of the routine in caring for cattle on collective and state farms.

The animals are well cared for. Most often women care for the animals, and they apparently have a love for cattle and give them close attention. Animals, even herd bulls, seemed very docile in response to this treatment.

The barns and yards in which the animals were kept were clean. However, there were not many concrete yards and, when it is wet, yards no doubt are very muddy.

Milking Practices

It is the usual practice to milk cows three times daily. Frequently, higher producing cows are milked four and even five times daily, particularly early in the lactation period. On the farms visited, the group observed good milking practices. These included cleaning the udder and teats before milking, using a strip cup, conditioning the animal, and then milking by machine or by hand. The milk from each milking is measured in a specially

designed measuring bucket, and the volume recorded. Samples for determining butterfat are taken on 1 or 2 days each month. Butterfat is determined by the Gerber method. The study group was told on a number of occasions that mastitis is not a serious problem since it is largely avoided by good milking practices.

Milk was strained through cloth from the bucket into receiving cans in the barn and the cans were stored in watertanks or, more often, transported soon after milking to the receiving station or factory. There was little evidence of refrigeration storage and no evidence of refrigerated bulk storage tanks on farms. Likewise, there was no evidence of steam sterilization facilities for sanitizing milk utensils on the farm, and frequently the water supply appeared to be limited. The availability of veterinary service on most farms no doubt aids in the sanitary production of milk.

The group could not determine how extensively machine milking was used, but their impression is that considerable effort is made on collective and state farms to adopt this method of milking. Most of the farms visited were using milking machines. It is very doubtful that any of the large number of cows on private holdings are milked by machine. Considerable attention apparently is given to improving milking machines. The Animal Husbandry Research Institute at Kharkov demonstrated a portable four-unit milking machine that they had recently developed. It was suspended on a carrier track behind the cows and could be moved along the string from one end of the barn to the other. It had individual compartments, each with a window and a device to measure the amount of milk, to receive the milk from four cows. The milk could be drained from this to a receiving can. The machine claws, cups, etc., looked much like those on our machines. This milker was apparently working well, but it looked crude and as if it would be difficult to clean.

This machine was observed in the Animal Husbandry Department at the Moscow Permanent Exhibition where it was being demonstrated. The machine utilizes what was called a special three-phase action which was claimed to do a faster and more complete job of milking than the conventional two-phase units. The principle utilized 45 to 50 pulsations involving 60 percent of the time in suction, 20 percent in pressure, and 20 percent in release. The vacuum was 400 mm. of mercury. Each unit will milk 40 cows per hour.

Calf Raising

Methods of raising young calves were good. Again, the availability of labor and love of animals afford the individual attention so necessary for successful calf raising. The methods used are not unlike ours. The calves are taken from their mothers 2 or 3 days after birth, after receiving the benefit of the colostrum, and are placed in individual pens or in small groups. Some of the individual pens were the raised-floor type. Calves receive whole milk for 2 or 3 weeks, then skim milk for 4 to 6 months. Green feed or hay is offered as soon as the calves will take it. A grain mixture also is offered and fed in moderate amounts until the calves are old enough to sustain themselves in reasonably good condition on forage. Antibiotics were used on some farms. Generally simple grain mixtures or single grains, such as oats or barley, were used. Milk replacers or starters were not used to any extent, probably because most farms have plenty of liquid skim milk available.

Feeds and Feeding Practices

Great emphasis is placed on roughage in feeding cows. In the northern humid regions, cows are pastured on good permanent pasture under intensive rotational grazing. In other areas, cows are kept in and green feed is fed in barns or in feeding yards. Several forage crops, such as grain crops, sudan, millet, sweet clover, alfalfa, and corn, are fed in season throughout the summer. Hay in limited amounts, corn silage, and straw are fed in winter. A grain mixture containing about 15 percent of protein is fed to producing animals at the almost universal rate of 1 pound daily to each 3½ to 4 pounds of milk produced. Feedstuffs making up the grain mixture are various combinations of several of the following, depending on availability: corn, barley, oats, mill feed, beet pulp, beet molasses, sorghum, and oil meals from flaxseed, cottonseed, and sunflowers. Corn silage is made from corn with few if any ears (in northern latitudes), or corn with the grain just forming on the cob. The corn is harvested early to obtain more protein in the leaves. The corn is grown thick, and the growing season is short, which may be another reason for early harvesting. Much of the corn silage is made in trenches, bunkers, or stacks. Much of it was rather sour and only of average quality.

Breed Improvement Programs

The breed development and improvement programs are handled by the Ministry of Agriculture through the various institutes and academies. A number of institutes had improvement programs in progress with collective and state farms for the breeds that they were

interested in. These programs may be different in the different Republics. Since all collective and state farms regularly record the volume of milk produced, and presumably most of them make butterfat determinations for individual cows in their herds, data on a large percentage of the cows are available for evaluating breeding material. It was not made clear how effectively these data are used nor was there evidence that a wide-scale sire evaluation and proving program was in progress. However, in Latvia, it was stated that 80 percent of the cows are on organized record-of-performance programs. The group was shown an elaborate system of forms just being adopted for data recording, analysis, and sire evaluation. These forms were very similar to the forms recently developed for similar work by dairy extension workers at Cornell University in cooperation with U.S.D.A.

Herd sire, Simmental breed—Animal Husbandry Research Institute, Kharkov.

At the Animal Husbandry Research Institute at Kharkov, the group was told that this institute is responsible for sire-evaluation work for all breeds for the Ukraine Republic. The breed improvement work is based largely on sire selection. Some work had been done before the war and they are just now getting back into this work in a broad-scale way. The man in charge indicated that the results of sire proving using daughter-dam comparisons are confounded by the steadily increasing level of feeding in recent years. For this reason, he stated, the sire-evaluation work is based on both the daughter-dam comparisons and on the daughter averages with contemporary comparisons of non-related animals in the same herd producing at the same time. With contemporary comparisons, milk yield, butterfat test and yield, and weight of animal are considered. The productivity of a bull's daughters is expressed as a percentage of the productivity of the mates and of the mothers and the mothers' mates. An example:

Mother's milk yield is 110 percent of her stable mates.

Daughter's milk yield is 120 percent of daughter's stable mates.

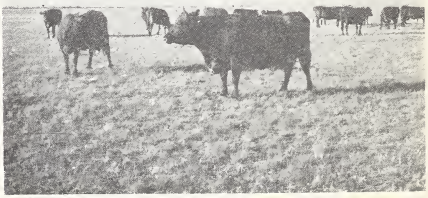
Sires—daughter-dam increase is 10 percent.

Sires—daughter contemporary increase is 20 percent.

Pedigree evaluation is also used to judge the merits of sires. This is depended on when insufficient information is available on production of a bull's daughters. The pedigree evaluation formula is as follows: $D = C + (M\text{-}C)\ 0.2 + (M_o\text{-}C)\ 0.1 + (M_m\text{-}C)\ 0.1 + (N_c\text{-}C)\ 0.45 + (M_s\text{-}C)\ 0.4$—where D = daughter's expected yield; C = herd average yield; M = bull's mother's yield; M_o = bull's sire's mother's yield; M_m = bull's mother's mother's yield; N_c = paternal and maternal full sisters' yield; M_s = yield of mother of a particular daughter.

At present only about 25 percent of the bulls in artificial breeding studs have been selected by one or the other of these methods, mainly the pedigree evaluation method. It is planned to expand these methods of sire evaluation as much as possible, especially for bulls in artificial breeding.

In addition to the sire-evaluation work, research institutes operate pedigree increase farms where breeding animals are raised and distributed to other farms or placed in artificial insemination studs operated by the institutes or to other studs.



Red Steppe and Red Steppe-Shorthorn Cross Cattle on native Steppe pasture—Askaniya Nova Agricultural Experiment Station, Southern Ukraine.

The herdbooks for the various breeds are also kept by the institutes. An animal apparently is considered a purebred and may become a pedigree animal if it is the result of three or four crosses to a pedigreed bull of the breed and meets certain standards set by the Ministry of Agriculture. These standards are based on live weight at a given age, produc-

tivity, and origin (breed characteristics). In the herdbook pedigree program, animals progress into the purebred class according to percentage of pure breeding. In addition, animals may qualify for three classes—elite, first class, and second class animals—depending on how well they meet the standards set by the Ministry. Animals under consideration are inspected by a committee of representatives from the Ministry and the institute.

This is a very active program; in all classes of livestock the number and the percentage of all collective and state farm-owned livestock have increased very rapidly (table 12). Pedigree animals constitute a much larger percentage of the livestock in the U.S.S.R. than they do in the United States. However, the herdbook programs of the two countries differ greatly.

White-faced Ukraine Bulls—artificial insemination stud, Animal Husbandry Research Station, Teresino.

Breeding Research

Extensive breeding research with cattle was in progress at all animal husbandry research institutes visited. This work is directed toward developing new breeds especially adapted for particular environments, improving existing breeds in milk yield, butterfat content, and size. The breeding work perhaps of necessity follows closely the Lysenko theory that all laws of heredity are subordinate to environment. A few examples of the research studies observed will be reviewed.

Breeding Research at Experimental Genetics Base

The study group had the opportunity to review Dr. Lysenko's research with cattle at the Genetics Experimental Base at Gorky. Dr. Lysenko subscribes to the Michurian Theory of Biological Inheritance. His research with dairy cattle was outlined to demonstrate this to the group. The primary object of the research is to increase the butterfat content in the milk.

The combination of breeds used offered a dam of a large breed giving low-test milk and a sire of a small breed giving high-test milk. The dam gives birth to a small calf that grows into a big cow which yields milk in volume like the large parent breed represented by the dam and with a fat content like the small parent breed represented by the sire. These crossbred animals when interbred or bred to animals of other breeds will yield offspring giving the same good result.

Dr. Lysenko theorized that the maternal embryonic environment controls the kind of cow the embryo will become—in this case a small calf at birth but a big mature cow. The calf mimics the uterine development of that of the dam. A requirement for the success of these results is that the cow must be in a high state of nutrition and production, particularly at the time of breeding and during gestation. He stated that the physiological processes of an animal depend on its environment. The embryo closely approximates the mother in her environment and he stated that he could forecast the way the embryo would develop as a cow, large or small, by knowing the environment of the mother. If a dam is fed poorly, it will not only produce poorly and have a lowered fat test but it will give birth to a small calf which will not grow as large as it would if feeding were normal. The group saw no evidence of animals being maintained on these different feeding regimes, or data that would support the statements made. Dr. Lysenko concluded, however, that he has created in these simple crosses a breed of cattle with characteristics of having small calves that grow into big cows that produce large volumes of milk of high butterfat content and that there will be no segregation in these characteristics. He stated that the development of a species is governed by certain laws of biology that need to be studied. This was about the only basis on which the study group and Dr. Lysenko could agree.

The foundation herd is the Kostroma breed, whose milk averages 3.5 percent of butterfat. The plan was to cross these with Jersey bulls imported from Denmark. These bulls apparently did not have tested daughters, and he assumed that their transmitting ability for butterfat was 5.5 percent, or the breed average. The offspring resulting from the first cross, he reported, produced milk with a butterfat content of 5.0 percent or higher (with only one exception). Furthermore, these offspring produced milk in large volume like the breed

of the dams. Dr. Lysenko stated the 75 bulls resulting from these first crosses when used on any other cattle would produce offspring that would give milk testing at least 5.0 percent. The cows observed by the group, both foundation and crossbreds, were good looking, productive cows. They lacked nothing in the way of care and feed to provide an excellent environment for them to express their hereditary ability to produce. The group observed no control population and there was no evidence of a carefully designed experimental plan. The group believes that feeding and management conditions have improved greatly in this herd in the last few years. When data were asked for to substantiate his statements, none were offered.

Dr. Lysenko stated that there was need for milk of a high butterfat content in the U.S.S.R. and his experiment was established to develop a strain of cattle that gave high yields of milk of high butterfat content. He said that the nutritive requirement per liter of milk is the same regardless of its butterfat content. This of course, is contrary to the belief of western scientists.

Research to Develop the Ala Tau Breed

One phase of the research of the Animal Husbandry Research Institute at Moscow and the Kazakhstan Academy of Agricultural Science is the development of a breed of cattle particularly adapted to the mountainous and irrigated valley region of southern Kazakhstan. The objective was to cross introduced stock with native cattle to develop a breed that yielded more milk and would have good meat qualities. This research was supervised by the tour guide, Prof. Aleksei Vsjakich of Moscow, who spent 8 years supervising the actual breeding herds, totaling 30,000 cows, located on farms near Alma Ata, Kazakhstan.

Foundation native dams were crossbred to Brown Swiss bulls. The female offspring were bred to Brown Swiss bulls to produce ¾ Brown Swiss, ¼ Kazakh. The superior animals resulting from the second cross, based on appearance and size (weight for age), were interbred and became known as the Ala Tau. The poorer animals were mated to Brown Swiss bulls to produce ⅞ Brown Swiss, ⅛ Kazakh. Their offspring were bred to the Ala Tau bull and the offspring became the Ala Tau. Intensive selection was practiced, particularly with the Ala Tau bulls used. Selection was based on color, appearance, milk yield, butterfat test, and body size. Large numbers of cows were available in state and collective farm herds, and intensive selection could be practiced. The animals that the study group observed represented the second, third, and fourth generations. They were large, productive animals of good fleshing qualities and they looked very much like our grade Brown Swiss cattle. Again there was no evidence of control populations to measure progress being made.

Research With the Red Steppe Breed

The Askaniya Nova Research Institute under the direction of N. T. Balaskov has a major breeding research project with cattle of the Red Steppe breed. Academician Grebin and Mrs. Decinanio reviewed this research for the study group.

Three phases of work are in progress: (1) To improve the Red Steppe breed; (2) to create a new commercial dual-purpose type by crossing the Red Steppe with the Shorthorn; and (3) to improve adaptability and increase the butterfat content of the milk of the Red Steppe by crossing with the Zebu. In addition, this station supervises the breed registry and the breeding policy of the Red Steppe breed. They also operate a state farm for increase in pedigreed Red Steppe breeding animals for distribution to the industry.

Three lines of Red Steppe cattle have been established at this farm: (1) High milk yielding line; (2) high butterfat testing line; and (3) high meat line. The establishment of the high butterfat test line based on the performance of one outstanding cow was illustrated. The technician stated that heritability of a characteristic takes the direction of selection, and in this case the prime consideration in relation to the inheritance of butterfat percentage should be given to the dam.

In forming this high test line, a foundation cow, No. 48, was the prime contributor. What she descended from seemed unimportant. Her nine lactations ranged from 5,060 pounds to 9,460 pounds of milk and the test varied from 4.5 percent to 4.8 percent. She produced two daughters from two bulls. One bull was from a dam with one reported lactation of 11,644 pounds of milk testing 3.6 percent. The daughter from this bull and the foundation cow No. 48 had five lactations that ranged from 7,040 pounds to 8,140 pounds of milk and the test varied from 4.1 to 4.4 percent. This daughter was bred to a bull from a cow that produced in one lactation 8,000 pounds of milk testing 4.23 percent. The female offspring from this mating had two lactations of 6,233 pounds and 6,158 pounds of milk testing 4.28 percent and 3.93 percent, respectively. The average test for the herd is about 3.8 to 3.9 percent. No information was available on the dam of the

other bull mated to cow No. 48. The daughter from this bull had three lactations that ranged from 5,654 pounds to 9,460 pounds of milk and the test varied from 4.1 percent to 4.8 percent.

Five bulls from the foundation cow, her two daughters, and one granddaughter are presently being used in artificial insemination to establish this high test line in the state farm herd. One of these bulls has been proved both on pedigreed cows and on grade cows. The 27 purebred daughters by this bull averaged 3.95 percent butterfat and their 27 purebred dams averaged 3.68 percent, a difference of 0.27. The average butterfat test of his grade daughters was 3.75 percent and of their dams, 3.78 percent—a difference of 0.03. These were all the data they could show to substantiate their claim of the establishment of a high butterfat test line and the mode of inheritance of butterfat. The group was not convinced.

The crossbreeding work with the Shorthorn is designed to develop a type that includes high milk yield, high butterfat test, and good carcass quality. They are looking for a higher meat-to-bone ratio than is present in the Red Steppe breed, with a lean meat that is more juicy, more tender, and more marbled. They anticipate this will be achieved with a combination of ⅞ Red Steppe and ⅛ Shorthorn.

Breeding Research With Simmental Cattle at the Animal Husbandry Research Institute, Kharkov

This station is the principal oganization doing breeding research with the Simmental breed. They also work with the Lebedin breed, which apparently was founded at this station, and with the Red Steppe.

The work with Simmental cattle is directed toward increasing the milk yield and the butterfat content of the milk. In the last 12 years they have been establishing in this herd two lines—one, a high milk line and the other, a high fat test line. At present the high milk line is averaging 18,260 pounds of milk with an average test of 3.75. The average cow weighs 1,748 pounds (mature) and yields about 1,000 pounds of milk per 100 pounds of body weight per lactation.

The high fat line is averaging 12,100 pounds of milk with an average test of 4.2 percent. The average cow weighs about 1,430 pounds (mature) and yields about 800 pounds of milk per 100 pounds of body weight per lactation.

These lines were established by selection and use of bulls that sired daughters that were high in milk yield or that had a high butterfat test for use on the respective lines. Considerable line breeding was practiced and of course rigid selection was used. When these lines are firmly established and fixed, they will be crossed with the anticipation that the crosses will express both the high milk yield and high fat test of the parent lines.

Some years after the establishment of these lines was begun, a third line was established by breeding and selection for both high milk yield and high fat test. This line is to serve as a control to compare with the crosses that will be made from the high milk yield and the high test lines. This breeding research project was as good as any the group saw.

As mentioned earlier, this station has responsibility for operating the central office for sire evaluation for the Ukraine Republic. In addition, it maintains a large state farm for increase in pedigreed cattle and other classes of livestock where breeding animals are produced for distribution to collective and state farms in the Republic. The station also maintains laboratories for research in artificial insemination and physiology. Work in these laboratories will be covered elsewhere in this report.

The institute operates an artificial insemination station where many of the bulls developed in the breeding research projects are in service. This stud maintains bulls of the Simmental, Red Steppe, Lebedin, Friesian, Grey Ukraine, and White Faced Ukraine breeds and services the Crimea and northern Caucasus regions as well as the northern Ukraine.

Related Breeding Research Activities

There was no evidence that associated with cattle breeding research corollary investigations of basic genetic studies were underway with small laboratory organisms. Further, no evidence was apparent of basic chemical, genetic, or immunogenetic research. In reply to questions about blood typing research and usage, the group was told that this kind of work was planned but as yet none was in progress. Questions were asked on several occasions about breeding research to alter the composition of milk, other than fat percentage. Several workers indicated that plans were being made to initiate research in this area.

The study group did not learn much from the breeding research reviewed. While the work had the advantage of large numbers, there was lack of controls in most projects. Also, the improvement in feeding and management that has taken place since the end of World War II, even on the experiment station, confounds the measurement of progress in breeding research. By the same token, it probably makes Dr. Lysenko's theories easy to explain.

Beef Production Processing and Marketing

The study group had little opportunity to observe this phase of the cattle industry. The processing and marketing supervision apparently is handled in the Ministry of Industries, and there was no opportunity to make contact with it.

Practically all of the beef comes from the breeds of cattle that are used mainly for milk production. The group saw no stock being fattened for marketing and was told that very little of it is being done. Feed lot fattening, similar to that in the United States, is practically nonexistent. Some attention is being given to developing types that have better beefing qualities.

The group learned in Latvia that producers were beginning to raise and fatten their surplus bull calves from milk-producing herds. They are marketed at from 500 to 550 pounds live weight. The group was told that in Latvia the average beef meat yield is about 55 pounds per acre. Most of the collective and state farms reported low production of beef meat.

On many collective and state farms, beef for local consumption is slaughtered in abattoirs on the farm. Marketed animals move by rail or by driving them on the hoof to packing plants in the larger cities. Some trucking of cattle is taking place, particularly between major points. The group was told that some Siberian slaughterhouses and meat packing units are arranged on railway cars, so that the animals can be received, slaughtered, and inspected and the carcasses stored in refrigerator cars for transport.

Beef that moves into slaughterhouses, in some instances at least, is graded and paid for according to weight and condition. Carcasses are graded at the packing plants, but we were unable to obtain a copy of the grades and standards used. In some instances evaluation of carcasses on a research basis is done by technicians at the packing plant. Veterinarians routinely inspect animals slaughtered at packing plants.

Milk Processing and Marketing [1]

Milk is available to the Soviet consuming public as fluid milk, cream, and a variety of cultured milks such as kefir and yoghurt, butter, cheese, concentrated milk, and dried milks. The breakdown in use of the milk supply byproducts could not be ascertained. Cultured milks are popular, yoghurt and kefir being much used as breakfast foods.

First dairy combine milk processing plant—delivery warehouse, Leningrad.

In the larger cities much of the milk supply is used as fluid and cultured milks, whereas in the outlying areas most of it is manufactured into butter, cheese, or concentrated and dried milks. In the larger cities, dried milk and butter are used during periods of short supply for reconstituting as fluid milk.

The Vice Minister of Agriculture E. M. Checkmenev stated that in 1959 the 205 million people of the U.S.S.R. would have available for use about 660 pounds of milk per capita. He indicated that the goal was 858 in 1962, and 1,188 pounds in 1965. He stated further that Soviet medical doctors and nutrition authorities recommended that the best level of consumption would be 1,188 pounds (milk-equivalent basis). He further indicated that production plans, in addition to outdoing the United States in total milk production, are geared to reach this goal. This indicated 1959 supply compares with the expected approximate 710-pound production and 695-pound consumption per capita (milk-equivalent basis) for the United States. The trend in the per capita production and consumption is upward in the U.S.S.R. and downward in the United States. It is interesting to note that production and consumption goals in the U.S.S.R. appear to be closely tied to recommendations of Soviet nutrition authorities.

The study group visited the First Dairy Combine in Leningrad, one of the largest dairy processing and marketing establishments in the U.S.S.R. A description of the general methods of milk marketing and utilization in the U.S.S.R. and the operations of this Leningrad plant, as it was given by the director, follows:

Animal husbandry study group sampling dairy products of the first dairy combine, Leningrad.

A government-sponsored All-Union Dairy Organization has for its objective the development of dairying. Each major production region has a branch of this parent organization. The director of the First Dairy Combine of Leningrad is a director of the All-Union Dairy Organization and of the local Leningrad branch. In addition to their efforts to increase production, the central organization concerns itself with methods of utilization by coordinating milk and dairy products manufactured in the different production regions. Thus in the

[1] For additional information on milk and milk products the reader is referred to Economic Trends in the Soviet Dairy Industry, by Marko Lamer in Vol. 7, No. 5, Monthly Bulletin of Agricultural Economics and Statistics, Food and Agriculture Organization of the United Nations, Rome, Italy, May 1958.

regions around large cities, such as Leningrad, most of the milk is directed into fluid use except during the summer period when surpluses go into the manufacture of cheese, butter, and concentrated or dried milk. On the other hand, the organization directs certain specialties for the outlying dairying regions; for example, Siberia specializes in butter; the Central European Republics in cheese, and Latvia and White Russia in butter. This is largely because of transportation difficulties and expense in moving fresh fluid milk from the outlying areas to central points. This, of course, is not unlike the organization of milk marketing in the United States.

While some of the skim milk and whey is dried, a major portion is used for animal feed. This is true today and probably will remain so for some time because of the relative cheapness and availability of these products in farming areas and especially because supplies of other protein feeds are short and expensive. In the butter and cheese areas, much of the milk is processed in plants operated on state or collective farms or by other government-owned organizations in the local communities. Thus the skim milk and whey are readily available for animal feed. There were indications that much of the milk produced in excess of family needs by cows owned by private individuals is churned into butter, the skim milk being used for livestock feeding and the butter sold. Some of this milk undoubtedly also is sold locally for fluid use.

The Leningrad First Dairy Combine is one of three and the largest dairy plant in the Leningrad area. It handles as much milk as the other two combined. One of the others apparently is a condensing plant. The First Dairy Combine was organized in 1934 with a capacity of 432 tons of milk per day. Its present capacity is 1,050 tons daily with a storage capacity of 10,000 tons. Future plans are to increase plant capacity by 70 percent.

Leningrad and the immediate environs are the market for the products of this plant. The daily output of the different products is adjusted to demands by diversion of milk from one product to another. Products are delivered to trading organizations and retail stores by some 150 plant trucks. Fluid products are delivered both in bottles and in bulk cans. There were bottled products in stores, but there was little evidence of door to door delivery of milk. Trading organizations dispense much of the milk in bottle or bulk from dispensing stores scattered throughout the city. These were small rooms facing the streets where people came with bottles, cans, or other utensils to obtain milk. The milk is dispensed by an attendant clothed in a white frock. There usually was no screen on the doors and windows and the rooms were quite dark and of varying degrees of cleanliness and neatness.

Most of the milk received by the plant comes from state and collective farms; the amount from privately owned herds was not ascertainable. In addition to the immediate Leningrad area, the milk supply comes from north and east of the city as far away as 180 miles in summer and even farther in winter. The nearby milk is hauled in cans by trucks, and the distant milk comes in refrigerated tank cars (8°-10° C. with variation of less than 2° C.) or in cans by rail. All milk is received by the time it is 24 hours old. There is almost a 100-percent difference in the milk supply between summer and winter.

Sanitary control of milk production and processing is supervised by the veterinary service in the Ministry of Agriculture. It consists of a system of municipal and district control stations. In the smaller communities and on collective and state farms, sanitary inspection appears to be done by the Ministry of Agriculture of the Republic in coordination with the veterinary service. Most collective and state farms with livestock enterprises have veterinarians on the technical staff who function in animal health and sanitary milk supervision and control. The Leningrad plant has the services of two sanitarians who work in the plant but are on the staff of the municipal Central Laboratory Council. The usual inspection tests on milk received at plants, such as organoleptic, sediment, butterfat, and bacterial culture, are made routinely.

The Leningrad First Dairy Combine is organized into four departments; (1) Fluid Milk, (2) Dietetics, (3) Cheese, and (4) Process Cheese. All milk except that used in the Dietetics Department is pasteurized at a temperature of 73°-75° C. for 20 seconds. Pasteurizing capacity is 70 tons per hour. Bottling facilities consist of three units of 1,200 bottles per hour capacity and a special 5-gallon can filler of 12 tons per hour capacity. Pasteurized fresh fluid milk in bottles, cartons, or in bulk is produced for delivery. Pasteurized light and heavy cream with 10, 20, and 30 percent fat is also produced.

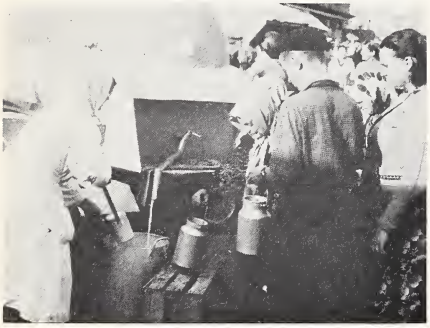
At the time of the group's visit about 80 percent of the incoming milk was used in this department. Plans are being made to initiate the production of sterilized milk, a product that is becoming increasingly popular in northern Europe, England, and to a slight extent in the United States.

The Dietetics Department processes milk into kefir, yoghurt, acidophilus, and similar products

for distribution in bottles. These products, especially kefir and yoghurt, are very popular breakfast foods and appeared to be of very good, uniform quality.

This department has two bottling units with a capacity of 220,000 bottles per 16-hour day and adequate storage facilities for maturing the cultured products at 24° C. for 20 hours. The cultured products are marketed in long, narrow-necked bottle with different colored caps to distinguish one product from another and from fresh fluid bottled milk.

The Cheese Department deals mainly with a product known as cottage cheese. It is unlike our cottage cheese; it is more like a cheese paste with the consistency of our cream cheese, though it is low in butterfat. The curd is ground on rollers and thoroughly macerated; raisins or nuts may be mixed with it, or it may be flavored with chocolate or lemon; it is packaged, and sold as cottage cheese. It has a smooth texture and is rather sour tasting. The plant capacity for this product is 150 tons of milk per day.



Street milk delivery, Stavropol.

Manager and dairy maids—Red Partisan Collective Farm, Leningrad.

The Process Cheese Department produces natural-, chocolate-, coffee-, and lemon-flavored process cheeses, which are packaged in small aluminum and paper wrappers of about ¼ to ½ pound per package. These products are made from cheese shipped in from numerous small factories in outlying areas such as small communities and collective and state farms.

The equipment in the plant is both foreign and Russian made. All of it looks like Western equipment. An American paper carton maker and filler was not in use and was reported to be unsatisfactory. A new large shipment of British equipment had recently been received but was not yet installed. This was no doubt part of a large purchase that the U.S.S.R. had consummated in Britain in June 1959. Much of the equipment was old and of heavy construction but appeared to be working well. The plant layout was not modern and efficient in its use of labor, but this is unimportant since labor is plentiful.

The ventilation was poor and the air in the plant generally suggested the odor of cultured milk and sour curd. Nevertheless, the group had the opportunity to sample most of their products and they were palatable and good quality.

The Director of the Leningrad plant stated that producers were paid 12 to 15 cents per liter of milk depending on the season, the price being lower in the flush summer season. The processor pays the farm-to-plant transportation costs. If the milk is of inferior quality, the price is less. The minimum butterfat requirement is 3.2 percent. The average butterfat content of milk received at the plant is 3.56 percent. The average butterfat content of the pasteurized fluid milk issued to the trade is 3.5 to 3.2 percent. He further stated that the cost of a liter (slightly more than a quart) of milk to the consumer was 22 cents. (Prices for dairy foods in a Leningrad retail store, as observed by the study group on the day they visited this dairy plant were: pasteurized bottled milk, 27 cents per liter; butter, $1.20 per pound; and oleomargarine, 69 cents per pound. The price of milk in the Gum Department Store in Moscow was 20 cents per liter.)

Sheep and Goat Production

Sheep

Sheep production has always been important in the Soviet countries as wool and sheep skins are essential in their cold climate and mutton is a very common source of meat. Sheep numbers have increased steadily since the end of the war from about 80 million to about 130 million and further increases to 200 million head are planned by 1965. Relatively small increases in mutton production are wanted, but efforts are being made to increase wool production, particularly fine wool production. As shown in table 15 (appendix), fine wool production has more than doubled since 1953. They are now producing about 750 million pounds of wool and are importing over 100 million pounds, although some wool is also being exported. If their planned increases are realized, they probably will not only lead the world in sheep numbers but also produce a surplus of wool for export. However, per capita wool consumption may still be below some other western countries. Increased production of synthetic fibers is also planned. It is expected that fabrics produced in 1965 will contain 12 percent synthetic fibers and 88 percent wool.

The Soviet Union has a wide variety of types and breeds of sheep, as would be expected with the tremendous range of conditions under which sheep are run. Information on 28 breeds, summarized from Soviet material furnished the study group, is given in tables 4 and 5. This list is not complete but is probably representative. These breeds can be roughly classified into 13 fine wool, 7 semifine wool, and 8 coarse wool. Wool from the latter breeds, as well as some of the wool from the semifine wool breeds, would probably classify as carpet wool. Most of the breeds are classified as dual purpose for the production of both mutton and wool. Some are kept primarily for fur and sheep skins, while the ewes may be milked after the lambs are killed for their pelts. The fat-tail and fat-rump sheep are valued for fat as well as mutton production. Soviet specialists emphasized that many breeds were needed to fit the different climatic zones. Much of their effort in sheep breeding in the last 30 or 40 years has been devoted to the development of new breeds for their various climatic zones.

Askaniya (Rambouillet) ewe lambs, 5 to 6 months old —Askaniya Nova.

Précoce ewes on State farm near Kharkov.

Most of the sheep breeds observed were the fine wool type. These were generally bred for both meat and wool production, although in the Soviet Merino there was a wool type for arid lands and a meat-and-wool type for more favorable feed conditions. The fine wool types were generally the result of top crossing one or more Rambouillet, Australian Merino, Württemberg Merino, or Précoce rams on native Merino ewes. These native ewes are descended from Spanish

TABLE 4.—*Characteristics and distribution of breeds of sheep and goats in the U.S.S.R.*

Breed	Type	Purpose	Date established	Special characteristics
Sheep:				
Soviet Merino	Fine wool	Wool-meat		High wool production.
Salsk	do	Fine wool	1930–49	
Groznyi	do	do	1938–51	High wool quality.
Stavropol	do	do	1923–51	
Azerbaidzhan	do	do	1932–47	
Askaniya	do	Wool-meat	1925–35	High production wool and meat.
Caucasus	do	do	1923–35	
Altai	do	do	1930–48	Adaptability and durability.
Zabaikal	do	do	1927–56	Adapted to harsh conditions.
Précoce	do	do	1925–28	High productivity, early maturing, meat form.
Vyatka	do	do	1936–56	
Kazakh Fine Fleece	do	do	1931–45	
Kazakh-Arkharo-Merino.	do	do	1935–50	
Tsigai	Semi-fine wool	do	Long ago	
Georgia	do	do	1932–49	Fat tailed.
Dagestan	do	do	1932–50	
Kuibyshev	do	Meat-wool	1936–48	
Lithuanian Black Face.	do	do	1918–40	
Latvian Black Face	do	do	1937–49	
Gorkyi	do	do	1936–49	
Romanov	Coarse wool	Sheepskin, fur	Early origin	Sheep skins and fur.
Karakul	do	Pelts-milk	Ancient origin	Lamb pelts, fat tailed.
Gissar	do	Meat-fat	Early origin	Fat tailed, brown or black, large.
Edilbaev	do	do	do	Fat tailed, red, brown, black and white.
Saradzhin	do	do	do	Fat tailed.
Balbas	do	Meat-fat-milk	do	Fat tailed, white with dark spots.
Mikhnov	do	Wool-meat	do	Coarse wool production.
Cherkassy	do	do	do	Long, thin tails.
Goats:				
Woolly goats	Mohair	Mohair	1937–1952	
Pridon Downy goats	Down	Down	Early origin	Black with grey or white down.

Breed	Areas of adaptation	Basic areas where kept
Sheep:		
Soviet Merino	Arid steppe	North Caucasus, Povolozhye, Siberia, Kazakstan.
Salsk	Salsk steppe	Rostov, Saratov and Astrakhan districts.
Gronznyi	Steppe, Continental climate, seaside pastures.	European and Asian parts of U.S.S.R.
Stavropol	Steppe with Continental climate	Stravropol, Krasnodar, Rostov, Saratov, Astrakhan and Kazakhstan.
Azerbaidzhan	Mountain pastures	Transcaucasian Republics and in foot hills and mountains of Northern Caucasus.
Askaniya	Steppe	Soutnern Ukraine.
Caucasus	Steppe	Northern Caucasus and Povolzhye.
Altai	Siberia	Siberia and Northern Kazakhstan.
Zabaikal	Chitinsk district	Chitinsk to Eastern Siberia.
Précoce	Wide	Widely scattered over the U.S.S.R.
Vyatka	Kirov and Gorkyi districts	Kirov and Gorkyi districts.
Kazakh Fine Fleece	Kazakhstan	Kazakhatan.
Karakh-Arkharo-Merino	Mountains	Kazakhstan.
Tsigai	Southern Russia, Ukraine	Ukraine, Povolzhye, Western Kazakhstan, Siberia, Urals.
Georgia	Georgia	Georgia, Dagestan and North Ossetin Regions.
Dagestan	Mountains	Dagestan.
Kuibyshev	Kuibyshev and Ulyanov districts	Kuibyshev and Ulyanov districts.
Lithuanian Black Face	Lithuania	Lithuania.
Latvian Black Face	Latvia	Latvia.
Gorkyi	Gorkyi	Gorkyi district.
Romanov	Yaroslav and Ivanovo regions	Also in other regions of North and Northwest U.S.S.R.
Karakul	Uzbek, Turkmen SSR	Kazakhstan, Tadzhik, Crimea, Moldovia, Tuvin, Ukraine.

TABLE 4.—*Characteristics and distribution of breeds of sheep and goats in the U.S.S.R.*—Continued.

Breed	*Areas of adaptation*	*Basic areas where kept*
Sheep—Continued		
Gissar	Foothill and high mountain pastures	Tadzhik, Uzbeck, Kazakhstan.
Edilbaev	Western Kazakhstan	Western Kazakhstan.
Saradzhin	Ashkhabad district, Turkmen	Also in Uzbek, Tadzhik and Kazakh SSR.
Balbas	Trans-Caucasus	Trans-Caucasus.
Mikhnov	Voronezh district	Evdakovsk, Ostrogozhsk and other regions of Voronezh district.
Cherkassy	Koshkin and Kutuzov regions	Also in Ulyanov district, and in the Tartar and Bashkir regions.
Goats:		
Woolly goats		Uzbek, Tadzhik and Kazakh regions.
Pridon Downy goats	Wide	Stalingrad, Orenburg, Rostov, Voronezh districts, and in different parts of Krasnodar region.

Breed	*Principal foundation breeding*
Sheep:	
Soviet Merino	Mazaev and Novo-Caucasian Merinos, Askaniya, Caucasian, Altai, Salsk, Stavropol, Azerbaidzhan.
Salsk	Rambouillet, Mazaev and Novo-Caucasian.
Groznyi	Australian Merino, Mazaev and Novo-Caucasian Merinos.
Stavropol	Rambouillet, Novo-Caucasian Merino, Groznyi.
Azerbaidzhan	Rambouillet, Caucasian, Askaniya, local Merinos.
Askaniya	Rambouillet, Ukrainian Merinos.
Caucasus	Rambouillet, Mazaev, Novo-Caucasian, Askaniya.
Altai	Rambouillet, Mazaev Merino.
Zabaikal	Soviet Merino, Novo-Caucasian, Buryat, Mongol, Rambouillet, Altai, Groznyi, Askaniya, Précoce.
Précoce	Précoce from Germany.
Vyatka	Northern short tailed, coarse wool sheep and local dense wool, Nolinsk sheep, Précoce, Rambouillet.
Kazakh Fine Fleece	Précoce, local coarse wool fat tailed sheep, Rambouillet.
Karakh-Arkharo-Merino	Wild Arkharo mountain rams, Novo-Caucasian ewes, Rambouillet, Précoce.
Tsigai	Tsigai from Balkan countries, Rumania and Hungary.
Georgia	Local coarse wool sheep and fine wool rams.
Dagestan	Wurttemberg coarse wool sheep.
Kuibyshev	Cherkassy, Romney Marsh, local coarse wool sheep.
Lithuanian Black Face	Northern short-tailed, coarse wool, sheep, Shropshire and other British breeds.
Latvian Black Face	Northern short-tailed coarse wool sheep, Oxford, Shropshire.
Gorkyi	Northern short-tailed coarse-wool sheep, Hampshire.
Romanov	Northern short tailed local sheep.
Karakul	
Gissar	Fat-tailed local sheep.
Edilbaev	Do.
Saradzhin	Do.
Balbas	Do.
Mikhnov	Native sheep.
Cherkassy	Do.
Goats:	
Woolly goats	Angora goats and local coarse wool goats.
Pridon Downy goats	Native goats.

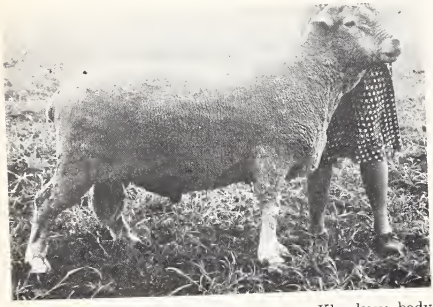
TABLE 5.—*Production records for breeds of sheep and goats in the U.S.S.R.*

Breed	Body Weight (pounds)					Grease Fleece Weight (pounds)				
	Males		Females		Champions	Males		Females		Champions
	Normal	Record	Normal	Record		Normal	Record	Normal	Record	
Sheep:										
Soviet Merino	165–187	288	99–110	229	154–275	22–26	52	11–13	30	20–44
Salsk	198–220	304	121–132	233	216–297	22–26	47	14–15	33	28–42
Groznyi	176–198	260	99–110	198	169–260	22–26	51	14–17	34	19–41
Stavropol	198–220	315	121–132	242	227–295	26–31	55	14–15	31	31–53
Azerbaidzhan	154–176	295	99–110	229	185–264	17–18	36	10–11	21	15–30
Askaniya	220–242	388	132–143	249	198–357	22–31	67	13	33	28–46
Caucasus	198–220	353	125–132	266	185–315	22–24	57	13–14	30	29–40
Altai	209–242	315	132–143	264	202–315	20–24	46	13–14	31	19–45
Zabaikal	198–220	331	121–132	216	216–242	18–22	32	10–12	24	20–29
Précoce	198–220	335	132–143	295	238–322	12–15	30	8–9	26	17–30
Vyatka	176–220	295	121–143	209	161–213	13–15	20	8–11	15	9–20
Kazakh Fine Fleece	187–220	308	132–143	220	185–297	13–15	31	9–10	17	14–24
Kazakh-Arkharo-Merino	209–220	315	139–143	209	198–297	14	25	7–8	14	13–25
Tsigai	154–176	324	99–110	284	189–284	10–13	23	7–9	18	12–21
Georgia	154–176	268	99–110	200	165–255	10–11	22	7–8	12	11–22
Dagestan	176–198	293	110–121	235	209–260	11–12	20	7–8	15	12–20
Kuibyshev	220–242	362	154–176	288	246–362	13–14	22	8–9	18	13–19
Lithuanian Black Face	191–220		128–141				32		24	
Latvian Black Face	198–242		132–143			11–13	18	7–15	15	
Gorkyi	165–209	275	110–132	213	198–275	11–12	15	6–7	11	9–11
Romanov	132–154	238	88–99	191	125–238	4–7	9	4	7	7–8
Karakul	132–165	242	99–110	154	121–198	7	10	6	9	8–9
Gissar	264–286	419	176–198	335	335–414	4	6	2–3	4	4
Edilbaev	220–253	357	161–165	277	246–368	7	10	5–6	9	9
Saradzhin	198–220	295	143–165	242	264–295	10	16	6–7	14	7–8
Balbas	132–165	242	99–121	238	187–238	6	11	4	10	7–8
Mikhnov	147–180	271	106–132	191	167–271	13–18	26	7–11	18	11–14
Cherkassy	165–176	220	121–132	198	238–253	9–10	20	7–8	12	11–19
Goats:										
Woolly goats	121–143	233	84–101	125	119–183	8	14	4–5	11	11–12
Pridon Downy goats	143–150	231	88–99	145	172	1	4	1	4	1–4

TABLE 5.—*Production records for breeds of sheep and goats in the U.S.S.R.*—Continued.

Breed	Clean yield	Quality (spinning counts)	Staple Length				Champions	Lambs per 100 ewes lambing
			Males		Females			
			Normal	Record	Normal	Record		
	Percent		*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	
Sheep:								
Soviet Merino	36–45	60–64	2.8–3.2	5.3	2.8–3.2	4.7	3.2–4.9	120–130
Salsk	41–42	64	3.0–3.6	5.1	3.0–3.6	5.1	3.6–5.1	130–140
Groznyi	40–45	64–70	3.2–3.6	5.1	3.2–3.6	4.7	3.6–4.7	130–140
Stavropol	40–44		3.2	5.1	3.2	5.9	4.3–5.1	120–130
Azerbaidzhan	38–46	60–64	3.2	4.7	3.2	5.1	3.4–5.1	120
Askaniya	42–45		2.8–3.2	4.7	2.8–3.2	5.1	3.9	140–150
Caucasus	40–42		2.8–3.2	4.7	2.8–3.2	4.7	4.1	130–140
Altai	40–45	64	2.8–3.2	3.9	2.8–3.2	3.9	3.6–3.9	140–150
Zabaikal	46–48	64	3.0–3.4	4.5	3.0–3.4	4.7	3.4–4.5	115–120
Précoce	48–50	60–64	2.8–3.2	5.1	2.8–3.2	5.1	3.9–4.5	140–150
Vyatka	53–56	60–64	2.8–3.2	4.9	2.8–3.2	4.3	3.9–4.3	133–170
Kazakh Fine Fleece	45–55	60–64	3.0–3.6	4.9	3.0–3.2	5.1	3.4–4.3	132
Kazakh-Arkharo-Merino	50–53	60–64	3.2–3.6	4.9	2.8–3.2	4.3	3.4–4.9	125–130
Tsigai	55–60	46–50	3.6–3.9	5.7	3.2–3.6	5.7	4.7–5.9	130–140
Georgia	60–65		3.2–4.3	4.9	2.8–3.9	6.1	4.7–6.1	110
Dagestan	52–55		3.2–3.6	4.7	3.2–3.4	4.7	4.5	125–130
Kuibyshev	55–60	46–56	5.9–6.7	8.7	5.5–6.3	7.9	5.9–8.3	120–130
Lithuanian Black Face	56–60		3.2–3.6	5.7	3.0–3.6	4.7		140–170
Latvian Black Face	55–58		2.8	4.5	2.6	5.1		125–140
Gorkyi	55–60	56	3.2–3.6	4.7	3.2–3.6	4.7	3.4–4.5	130–150
Romanov								200–250
Karakul								100–110
Gissar								95–100
Edilbaev								110–120
Saradzhin								
Balbas								110–117
Mikhnov	70–80		6.3–7.1		6.3–7.1	14.2	10.2–15.0	100–110
Cherkassy	68–80		6.3–7.1	11.8	6.3–7.1		8.7–9.4	100–130
Goats:								
Woolly goats	75–80		7.1–7.9	11.8	7.1–7.9	11.8	6.7	110–116
Pridon Downy goats			2.8–3.6	5.1	2.8–3.6	5.1	4.7	170–185

Merinos imported at the beginning of the 18th century. The number of top crosses varied, but three seemed to be common. Some of the resulting new breeds were very similar to the introduced breed. When the desired number of top crosses had been obtained, the resulting descendants were interbred, sometimes with later introduction of other breeds. Intense selection was generally practiced.



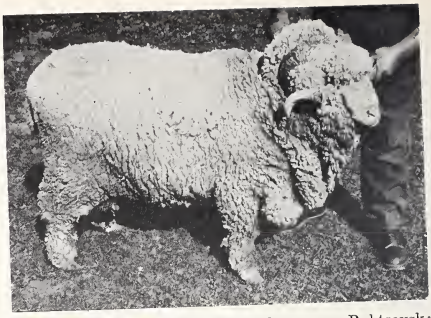
Aged Précoce ram on State farm near Kharkov; body weight, 315 lbs.; fleece weight, 28.6 lbs.

Fine wool breeds, such as the Askaniya, Stavropol, and Altai, were similar and compared very favorably to American Rambouillet although covered faces were common and skin folds were more evident. All had horned rams. There seemed to be little difference in conformation or wool quality although more emphasis was given to wool than in the United States. Wool production records seemed high but clean yields were fairly low and the records were apparently made under exceptional circumstances. Table 4 shows that the breed foundation of these fine wool breeds is similar, and some of their differences may be due to geographical location.

The Précoce was similar in appearance to the Targhee and was scattered over a wide area. These sheep were large, and had good mutton conformation, although fleece weights were lower than for some of the finer wool breeds which also had lower clean yields. This breed is polled, although horns sometimes occur as also does cryptorchism.

A number of black-faced, semifine wool breeds have resulted from introduction of British mutton breeds, such as the Shropshire, Oxford, and Hampshire. The only representative observed of these breeds was the Latvian Black-faced breed. They compared fairly well with similar type sheep in the United States.

Karakul sheep kept primarily for pelts were



Altai (Merino) ram on collective farm near Rubtsovsk; fleece weight, 38 lbs.

observed at Kharkov. The group was also told of the "high lambing" strain of Karakuls developed at Askaniya Nova. No other fat-tailed or fat-rumped breeds kept primarily for mutton and fat production were observed except for a few at Askaniya Nova. Here a variety of breeds and crosses had been collected from all over the world to study the effect of the local climate on wool quality and other traits.

Considerable information on distribution and location of breeds is given in table 4. In the Ukraine about 19 percent of the sheep are Askaniya, 36 percent are Précoce, 18 percent are Tsigai, and 18 percent are Karakul. In Kazakhstan 59 percent are fine-wool or semifine wool; 23 percent are fat-rumped, of which one-third produce carpet wool and two-thirds have mixed or primitive type wool and are kept mainly for meat; and 18 percent are Karakul.[1]

Sheep Improvement

The Soviets are attempting to increase production through breeding as well as by increasing numbers. Their breeding methods are characterized by emphasis on production traits, fairly consistent and uniform selection goals, emphasis on providing good or proper environment, and extremely intense selection made possible by large numbers under central control, and use of artificial insemination. Pedigree farms have been established to improve existing livestock and to produce new breeds. These are the best farms and are generally state farms. There are seven such farms for sheep in the Ukraine. They produce purebred

[1] Ritchie (Animal Breeding Abstracts 27: 375, 1959) cites 1955 statistics that of 51,851,000 sheep on collective farms 12,029,000 were Soviet Merinos and their crosses, 11,395,000 Précoces, 1,979,000 Caucasian Rambouillets, 992,000 Askanian Rambouillets and 407,000 Stavropol Merinos.

sires for artificial insemination stations and produce replacements for collective and state farms. A much larger number of farms reproduce the highly selected stock from the pedigree farms for general production.

Emphasis on production traits in breeding was evident everywhere we went. Fleece weight seemed most important. The farm director knew average and record fleece weights, often for several years. Prices of rams varied according to their clean wool production. Good yearling rams sold for $80 to $90 and good 2-year-old rams from $150 to $200. Wool quality was not neglected, however, and breeding animals were evaluated for length of staple, clean yield, fineness (visual but sometimes checked in a laboratory), strength, density, and sometimes other traits. Black fibers were discriminated against in the black-faced breeds. Mutton conformation and body weight at weaning and at 1 year were chief body traits considered. Attention to skin folds and face covering was not entirely consistent. Some favored skin folds and some did not, but in general, more folds on fine wool types were seen than in the United States. There was apparently some mating of smooth with wrinkled animals. Faces were generally covered, and covered faces were favored in selection of fine wool types, although open faces were said to be favored in some places.

In spite of some contradictions in folds and face covering, selection ideals or goals seemed consistent for a given breed or type of sheep. Standards and special breeding instructions are established for each breed. Also the Government has procurement standards for all wool, and prices are based on fineness and length, with special prices for different types of wool. Special counsels are established for each breed consisting of the main specialist for that breed and practical specialists from state and collective farms. A program for selection is prepared for each breed according to instructions for grading from the Ministry of Agriculture; it includes minimum production requirements according to quality and quantity of production. According to these requirements animals are classified into an Elite Class (top 25 percent), 1st Class (next 40 percent) and 2d and 3d classes. The latter two classes are used for commercial purposes and do not produce breeding animals. Each class is culled as numbers permit. Each animal is evaluated as a lamb (weaning) and at 1 year of age but generally not after that. They may be reclassified at the second evaluation. The very best rams and ewes in the Elite class are used to produce replacement rams and ewes for the Elite class.

Band of sheep of Askaniya Nova Breed on range at Red Herdsman State farm, Southern Ukraine.

Selected ram lambs are then fed better. Repeated references were made to the necessity for the proper environment and for creating special environmental conditions for each line. It was obvious that the highly selected rams were given exceptionally good feed and care. There was practically no evidence of attention to discounting or adjusting for measurable environmental factors in selection. Thus, it appears that environmental advantages were often confused with genetic advantages. This seemed to be one of the chief weaknesses of their selection program and it possibly resulted, at least in part, from adherence to the teachings of Lysenko.

Rams of Askaniya Nova Breed at artificial insemination stud, Red Herdsman State farm, Southern Ukraine.

The procedure for selecting rams was described on one pedigree breeding state farm in the Ukraine. Of 1,300 ram lambs produced each year the best 50 lambs are kept after weaning, including from 1 to 6 from each sire. At yearling age the best 20 of these 50 are retained. Each of the 20 is then mated to 60 ewes and all of these ewes are kept in one place to facilitate comparison of the offspring. Then the 8 or 10 with the best offspring are retained the next year. These are used for replacements for the 50 or 60 breeding rams (basic and reserve) needed for about 15,000 ewes. For

each ram used, two rams are kept in reserve. Thus not more than 10 and probably only 2 or 3 rams are used out of 1,300 produced from the Elite or highly selected flock. This is about 0.15 to 0.23 percent of rams produced, as compared to 2 to 4 percent or more, which is normal in the United States and would give an increase of about 40 percent in the selection differential for rams.

Representative of Fat Tail Breed of sheep—Askaniya Nova Agricultural Experiment Station, Southern Ukraine.

The group was able to examine the 50 selected ram lambs for this year. They were being kept in the barn on very good feed. The lambs were large and smooth. Only one or two had heavy neckfolds. All had covered faces. The wool was long and dense, and the group was quite uniform in appearance.

There was no evidence of any effort to reduce the generation length for sires to increase the rate of progress per year. Sires, once selected, were often used for 5 or 6 years. It was stated, however, that a ram's offspring were evaluated each year by progeny test, and when the best son performed better than his sire, they were changed or the sire's use was restricted. However, a sire would be at least 5 years old before his first tested sons would be available.

The common use of artificial insemination with sheep was a primary factor in the intense selection possible. Normally 500 to 600 ewes were mated to each sire each year and 1,000 ewes per sire was common. Up to 17,000 ewes mated to one ram over a 115-day period was reported. Increased intensity of selection was given as the justification for using artificial insemination. An abundance of cheap labor made its use practical.

No special efforts to measure progress from selection were being made and time trends in

Band of sheep of Altai Breed on sudangrass aftermath with sudangrass hay stacks in background—Rubtsovsk State Farm Pedigree Factory, New Lands Region, Rubtsovsk.

production records were depended on to determine gains made. There were indications that production records were increasing although with the emphasis on improving environmental factors, such as feed levels, any genetic progress was a matter for speculation only.

Production data for fine wool sheep on farms visited showed average fleece weights of from 8 to 18 pounds with reported clean yields of 38 to 45 percent. These seem reasonable, as the data probably came from highly selected flocks on the better farms and they were much higher than the average production figures for the country as a whole. Clean yields were low, and this checked with our observation that wool on the sheep was deeply penetrated with dirt. Some of this may have resulted from the unusually dry summer. Staple lengths varied from 2.4 to 3.9 inches for wool ranging from 3/8 Blood to Fine in grade. These lengths would be reasonably equal to those for comparable grades of wool in the United States.

Average body weights reported for ewes ranged from 110 to 194 pounds with most of them in the 120- to 140-pound class. The sheep the group saw were in good condition and these body weights seemed roughly equal to, if not somewhat lighter than, comparable types of sheep in the United States. Very little information on weaning weights of lambs was obtained. In one area lambs about 6 months old weighed 92 to 95 pounds and in another area ram lambs about 4 to 5 months old weighed 66 to 77 pounds and ewe lambs, 55 to 66 pounds. A group of 7-month-old lambs near Kiev looked rather small by our standards.

Lamb production data from farms ranged from 110 to 165 for lambs born per 100 ewes and from 100 to 120 for lambs weaned per 100 ewes. Near Stavropol, out-of-season lambing was being practiced to increase the number of lambings per year. Records of 246 to 290

lambs per 100 ewes for two lambings were reported. Karakul ewes were reported to have produced 132 pounds of milk in 100 to 120 days.

Wool

Wool and mutton production are approximately equal in economic importance in the Soviet Union, although more emphasis seems to be directed toward increasing production of wool than of mutton. Furthermore, efforts are being made to increase fine wool production. Fine wool is classified as 60's and finer or with average fiber diameters of 25 microns or less. Semifine wools range from 32's to 58's in spinning counts, and additional classifications are made for coarser and mixed wools.

Fineness of wool is usually determined visually but cross sections are examined with a microprojector for more critical determinations. Airflow apparatus for fineness was also observed. It was said to be satisfactory, but the sample had to be prepared very carefully and an error of 1 micron was expected. Methods for evaluating staple length and wool strength are similar to those in the United States.

Clean yield is very important to the Soviets, as all wool is sold on a clean basis. Clean yield determinations are made on the farm but the identity of the wool is kept until after scouring and any difference between yield obtained on the farm and in the factory is negotiated. The method of sampling and scouring was described for a single fleece. The fleece is spread out and a wire grid is placed over it. A small amount is taken from each cell to make a 200-gram sample. A second sample is taken in the same way, and both samples are scoured. The wool is washed in soda ash and soap. The first tub is kept at 45° C., the next two at 50°, and the last tub at 45°. Extremely gentle agitation is provided by a washing-machine-type vibrator held in the hand in each tub. The washed wet wool is placed in a cylinder device with a hydraulic pump. Pressure is applied constantly to 200 kg. per sq. cm. within 1 minute. This leaves a constant moisture content in the wool, which is weighed to 100 mg., and a conversion table is used to obtain the clean yields for fine or variable wool. Conditioning apparatus is used for more accurate determinations. Clean wool was considered to contain 16 percent moisture.

The price of wool to collective farms ranged from $1.82 to $2.73 per clean pound. At 40-percent clean yield, this would result in grease weight prices of $0.73 to $1.09. Bonuses are paid for good quality wool. Likewise, deductions are made for poor quality. The cost of producing wool on one farm was given as 65 cents per pound.

Sheep pelts are used for coats, and dyed mouton coats are made for children. Karakul pelts are used in natural colors. Karakul and Sokol (grey fur) sheep are said to be essential for defense because the caps for generals and colonels are made with the fur.

Mutton

All sheep meat in the Soviet Union is called mutton, and many slaughtered sheep are over 12 months of age. The mutton we ate was very good. Mutton (shoulder cut) in the market was $0.64 per pound. Live slaughter sheep bring 32 to 41 cents per pound. Preference for meat is given as poultry and beef first, followed by mutton, and then pork, although in some areas pork is preferred to other meats. Canned mutton and liver were available as well as kidneys in tomato juice.

Feeding Practices

Sheep are carried on pasture the entire year in some areas, but more commonly they are pastured from April to December and are fed during winter on a daily ration of 2 to 4 pounds of hay, 3 pounds of silage, possibly some straw, and about one-half pound of grain, such as oats, corn, or barley. The grain ration is doubled during late pregnancy and lactation. Lambs after weaning receive from about ¾ to 1 pound of grain per day. Rams receive about 1½ pounds of grain per day and up to 3 pounds during breeding.

Pastures may include oats, vetch, timothy, orchardgrass, bluegrass, red clover, sudangrass, and alfalfa. Pastures are not clipped except for hay. Rye and wheat are used for winter grazing. There was considerable evidence of overgrazing, particularly on natural ranges. Kazakh sheep may stay in the mountains all year, grazing on the south sides in the winter at elevations of 8,000 to 10,000 feet and on the north sides in the summer at elevations of over 11,000 feet.

Management

Sheep management in the U.S.S.R. is surprisingly similar to that in the United States. Lambing occurs in February and March although sometimes as early as December. Open-type sheds or barns are used for lambing. In some areas, such as Latvia, lambs are not docked as nothing is gained by it. Castration is done at 3 to 4 weeks. Lambs are weaned at 4 months and are separated by sex and class (Elite, 1st class, etc.).

Shearing is done in May and June on tables with electric machines. Shearers make up to $12 per 8-hour day and shear from 60 to 110 sheep per man. Some sheep are sheared twice annually, and lambs are generally sheared at 6 months although late lambs may not be sheared. Fleeces are tied and sacked as in the United States. The shepherd clips wool from around the eyes of his sheep at irregular intervals, and ewes are crutched about a month before lambing.

Ewes are bred first at about 19 months of age although some of the best ewes may not be bred until 2½ years of age. Ewes should weigh at least 110 pounds at breeding. Breeding may extend from July to October or later. Ewes are generally artificially inseminated. Herds are divided into two groups, and five approved rams (reserve) per group are used to check ewes for heat. Ewes in heat are sorted out once or twice daily and may be inseminated twice if they are still in heat the next day. Rams are kept near the ewes to be inseminated and from three to seven collections per ram per day are made.

Ewes are usually culled for slaughter after 6 years of age but may be kept to 7 or 8 years of age. Rams may be used up to 8 years of age.

Sheep are practically always herded, although fenced pastures are said to be used in some cases. Women herders are common in farming areas, while men are more common under extensive grazing conditions. Ewes are run in herds of about 650 and wethers in herds of about 800. From three to four people are required for each herd. Shepherds may receive over $100 per month, plus 3 percent of the value of the wool. Sheep are generally corraled or penned at night. Some old ewes are generally included in lamb herds as leaders, and a white goat named Boris was seen in one herd.

About 40,000 sheep were kept on the "Ray of the East" collective farm in Kazakhstan. Of these 40 percent, or 16,000 head, were ewes. About 8,000, or 20 percent, were wethers. Wethers are often kept for 2 or 3 years for wool production. Wethers were said to produce about 60 percent more wool than ewes. There were 300 sires on this farm and 15,500 lambs. This indicates slightly less than a 100-percent lamb crop. Lambs are generally included in the sheep numbers reported.

Research in Sheep and Wool

Breeding research is concentrated on producing new strains or breeds. Work on selection is generally concerned with carrying out the procedure rather than in developing or improving methods. Considerable research is devoted to artificial insemination and storage of frozen semen, and ova transplants are being tried. Nutrition research is concerned with supplemental feeding and feed requirements.

Wool laboratory and personnel at Institute of Animal Husbandry, Kharkov.

Technician in wool laboratory at Institute of Animal Husbandry, Kharkov.

Wool research receives considerable emphasis. Inheritance of wool qualities and studies of the relation between wool traits were typical research underway. At Stavropol they are working on problems dealing with wool as a raw material on collective farms, in the laboratory, and in the factory. Work is underway on wool standards for industry and trading. Studies on the histology of the skin include observations on thickness of skin, components

of layers, depth of follicles, structure and depth of fat glands, and structure of the reticular layer. Methods of taking biopsy skin samples are identical to those we use. In general, research observed was not new or different from that underway in the United States. In fact, much research observed was similar to that conducted in earlier years here.

Goats

There were about 16 million goats in the U.S.S.R. in 1956, and most of these were privately owned, as reported by the economists study group.[2] They are used for milk, meat, down, and mohair. While goats have considerable importance, we were able to observe very little about them. Saanen goats have been imported to improve milk goats, and Angoras were brought from America to cross with local mohair breeds. Two breeds of goats are described in tables 3 and 4. Crosses of mountain goats with domestic goats and sheep have been attempted.

[2] Economic Aspects of Soviet Agriculture, U.S. Dept. Agr., Agr. Res. Serv., unnumb. pub., 78 pp., May 1959.

Fur Animals

Fur production is an important enterprise in the Soviet Union, but the study group obtained only limited information because the Fur Animal Institutes were generally separate from those dealing with animal husbandry. Some information was obtained at the Exposition in Moscow. While hunting and trapping of wild fur animals is practiced extensively, they also have commercial farms for planned production of fur animals, particularly foxes, mink, sable, and nutria. Foxes seem to be far more important than in the United States. Production of 1.5 million mink pelts is planned. Methods of raising both fox and mink appear to be very similar to practices here. Marten are not raised in captivity. Rabbits are raised for meat, but the group saw them only in markets.

Swine Production

Swine provide 54 percent of the meat supply in the U.S.S.R. In 1959, total meat production was 77 pounds per capita, or approximately 7.2 million metric tons (2,204.6 lbs.), according to statistics provided by the Ministry of Agriculture. By 1965 the Soviet Union expects to produce 20 million metric tons of meat, of which 9 million tons, or 45 percent, will be pork. This is a relative decrease in the proportion of pork in the diet, but it is approximately a 3.5-fold increase in pork produced, as compared with 1959.

On January 1, 1958, swine numbers in the U.S.S.R. totaled 44.3 million, of which 20 million were on collective farms, 9 million on state farms, and 15.3 million were privately owned.[1] The total number of swine had increased to 48.5 million by January 1, 1959. Assuming that swine will be produced with the same efficiency prevailing in 1959 and that slaughter weights will not change, swine numbers will need to increase to approximately 111 million by January 1, 1965, if the 1965 goal is to be achieved.

Breeds and Breeding Research

The U.S.S.R. has 19 recognized breeds of swine as given in table 6. This table was compiled from a picture brochure provided by the Ministry of Agriculture. The Large White and the Berkshire have had a marked influence on the swine population of the Soviet Union. In addition to its contribution as a pure breed, the Large White appears as foundation stock in 12 other Soviet breeds. The Berkshire appears in the foundation stock of eight breeds. The Long-Eared White is presumably a strain of the Deutsche Landschwein. The Danish Landrace appears in the foundation stock of the Breitov and the Poland China contributed to the Liven breed.

During brief visits at various farms and research institutions, the group saw only a small minority of pigs that did not appear to have some Large White breeding. At a farm near Leningrad we saw Swedish Landrace boars that were being used for crossing with Breitov females. At the Animal Husbandry Research Institute near Kharkov, Swedish Landrace had been introduced for crossing with Large White stock to develop a meat-type breed. At Askaniya Nova, the Mangalitza (Southeast European) breed was being used in a breeding program and at the Institute in Stavropol we were told that they were using Large Black and Deutsche Edelschwein as well as other breeds in crossing programs.

Swine breeding research in the Soviet Union appears to be concentrated on developmental aspects. Personnel at the All-Union Animal Husbandry Institute in Moscow told the group that eight new breeds or breed groups of swine have been developed during the past 20 years. They stressed the fact that the Soviet Union includes 13 climatic zones and they felt that special breeds were needed for each zone. The All-Union Institute works closely with the Regional Institutes in each zone. Each of the Institutes visited by our group in the various regions had breeding research underway. All this research involved crossbreeding, the development of new lines, or the improvement of old lines. During their travels, the group had only one opportunity to obtain details and to see the swine being used in a breeding research project. This was at the Research Institute in Askaniya Nova.

Academician Grebin, specialist in sheep and swine breeding and successor to Academician Ivanov, outlined the breeding work at Askaniya Nova.

The late Academician Ivanov began swine breeding research in 1926. Ivanov developed a new breed of swine, the Ukrainian Steppe, because he felt the Large White was not adapted to that region. He wanted an animal of high productivity, early maturity, and adaptability. By 1934 the new breed had been developed and tested and two new lines had been developed. The new breed has thicker, longer bristles and a straighter snout than did the Large White. The average number born alive is 11.2 pigs and the average number weaned is 9.2. The average male weighs 770 pounds at 3 years.

Grebin stated that the breeding plan is as follows: Local Ukrainian females are crossed with Large White males. The F_1 females are backcrossed to Large White males as were the F_2 females. Following the second backcross

[1] See footnote 2, page 41.

the herd is closed and mild inbreeding and selection are practiced. Grebin said that five additional lines had been developed since Ivanov's death so that they are now working with a total of seven lines.

Grebin placed great stress on ruggedness, particularly size of bones and chest circumference. They measure the length of the live pigs, from the poll to the root of the tail. They also measure the chest circumference and have developed an index based on chest circumference/length. For example, one boar that weighed 550 pounds at 12 months was 69 inches long and had a chest circumference of 67 inches for an index of 98. As mentioned earlier, Grebin has developed several new lines, some apparently from crosses similar to those made by Ivanov and others through the crossing of other breeds with the native stocks. He has practiced inbreeding and crossing of the inbred lines. From one such cross he developed a spotted pig in 1939. He stated that they now have 6 lines and 18 sow families of these spotted pigs. They have developed also a line that is almost entirely black so that it is protected against the sun. This line came from a cross of native females and Berkshire males. They are now working toward developing a line of bacon type. Their goal is a pig that weighs 220 pounds at 7 months and that requires not more than 1.8 feed units (1 F.U. = 1 kg. oats) per pound of live weight gain.

The group had only a few minutes to look at samples of the various lines in the herd near Askaniya Nova. These included sows, elite spring-farrowed gilts, and boars of several ages. The lines of spotted pigs were fatter than the lines of Large White origin but the former had larger hams. There were noticeable differences in type between the lines, though Grebin's stress on ruggedness was apparent in most of them. The major emphasis in breeding was on production factors, such as litter size and weight for age; little attention was paid to feet and legs, arch of back, femininity of females as expressed in head characteristics, and similar characteristics.

In all of our contacts in the Soviet Union, among research people as well as farm chairmen, emphasis was always on productivity factors, whether we were discussing swine or sheep or cattle, and virtually no attention was paid to such non-production factors as breed type, color, or breed characteristics as we judge them.

In the Ukraine as well as in other areas, special farms are maintained for purebred seed stock production. It was stated that there are 13 swine farms of this type in the Ukraine. At some of these farms inbred lines are produced particularly to supply boars for crossbreeding.

Feeds and Feeding Practices

The U.S.S.R. harvested about 59 million acres of corn in 1958, of which 40 percent was grain and the remainder was used for green feed and silage.[2] The estimated production of corn grain was 600 million bushels, which is about 17.6 percent of the 3.4 billion bushels of corn produced in the United States in 1958. The major cereal crop in Russia is wheat, of which they produced 2.3 billion bushels in 1958 as compared with United States production of 1.46 billion bushels. Thus, they apparently have a considerable tonnage of wheat byproducts for feed use. The group did not obtain data on this. Rye accounted for 14.4 percent of the acreage planted to cereals in 1958; oats, 11.7 percent; and barley, 9.0 percent. Wheat and rye were not mentioned as feeds for livestock, and presumably neither is used in that way. Their principal high protein feeds of plant origin are cottonseed oil meal and sunflower seed oil meal, both of which are deficient in lysine for balancing swine rations. Soybean oil meal appears to be a minor product and was mentioned as a swine supplement at only a few places. The Soviet Union does feed relatively large quantities of skim milk, buttermilk, and whey to pigs; also packinghouse byproducts and some fish meal are fed.

The use of cereals in swine rations was generally limited to barley and oats and a relatively small amount of corn. Maximum use

Boar of Ukrainian Spotted Breed—Askaniya Nova Agricultural Experiment Station, Southern Ukraine.

[2] Crops Research in the Soviet Union, U.S. Dept. Agr., Agr. Res. Serv., unnumb. pub., 26 pp., August 1959.

TABLE 6.—*Description of*

Breed	Foundation stock	Origin and area of popularity	Type
1. Large White [1]	Northern European	Throughout U.S.S.R.	Meat-Lard
2. Ukrainian Steppe	Local, Large White (Kerza line)	Ukraine and Stavropol Dpt.	do
3. Mirgorod	Local, Berkshire, Medium White, Large White, Temvor.	Ukraine and Poltav, Stalin and Moscow districts.	do
4. Breitov [2]	Local, Med. Danish, Lge. White, Latvian.	Yaroslav, Mogilev and Leningrad districts.	do
5. Liven	Local, Large White, Medium White, Lincoln, Berkshire, Poland-China.	Orlov, Lipetsk and Voronezh districts.	do
6. Siberian Northern [3]	Local, Large White	North, Central Siberia	do
7. Kalikin	Local long-eared	Ryazansk, Lipetsk, Tambov	do
8. Northern Caucasus	Local Kuban, Berkshire and Large White.	Stavropol, Krasnodar areas; Kabardinian ASSR.	do
9. Urzhum [2]	Local long-eared and Large White.	Kirov, Moscow, Leningrad districts; Mari ASSR and Tatar ASSR.	do
10. Murom [2]	Local, Lithuanian and Large White.	Vladimir, Gorky and Tula districts.	do
11. Berkshire [1 2]	English Berkshire	Throughout U.S.S.R.	Lard
12. Long-eared White	German	Kuibishev, Kiev, Lvov, Volyn, Chernigov districts; Latvian SSR, Tatar ASSR.	White
13. Krolevets	Local, Berkshire, Lg. White	Suma, Chernigov districts	Meat-Lard
14. Kemerovo	Siberian, Berkshire, long-eared White.	Kemerovo, Omsk and Krasnoyar districts.	Lard-Meat
15. Estonian flap-eared [2]	Local, Danish Landrace	Estonian SSR	Bacon
16. Latvian White [2]	Local, Berkshire, Short and long-eared Whites.	Latvian SSR	do
17. Leso-Gorni [2 4]	Local, Berkshire, Large White	North Caucasus, Tula and Krasnodar Forest regions.	Meat-Lard
18. Iyevlev [2]	Local long, short-eared, Yorkshire, Berkshire, Temvor.	Tula and Moscow districts	do
19. Moldavian Black	Local, Polish, Yorkshire, Berkshire and Temvor.	Moldavian SSR	do

[1] These breeds imported from England apparently have played a significant role in crossing with local strains and breeds in formation of several of the presently recognized breeds of swine in U.S.S.R.
[2] Described to be adapted for good performance on rations of potatoes, pasture and fresh forage.
[3] Heavy bristles with dense underhair to protect animals from cold.
[4] Especially adapted for foraging in dense forest.

Russian swine breeds

Principal color markings	Approximate date of origin	Standards for mature males and females						
		Boars			Sows			
		Live weight	Trunk length	Breast girth	Live weight	Trunk length	Breast girth	Pigs farrowed per litter
		Pounds	*Inches*	*Inches*	*Pounds*	*Inches*	*Inches*	
White		770–990	67–73	65–71	550–595			11–12
do		660–770	70	67	500	62	60	11–12
Black spotted	1940	550–770	60–65	62–68	440–550			10–11
White		630	65	64	520	60	58	11–12
White, black, spotted	1933	690	69	66	530	61	59	12
Black, white, spotted		660–770	64–65	63–64	440–460			10–12
White, black, spotted		495–550	59–61	55–60	420–440	55–59	53–57	10–11
Spotted		638–660	63–69	65–69	484–500	60		11
White		770–880	73–79	69–71	506–550	62–65	59–62	11–12
do		594–616	63–69	62–67	484–594	59–65	57–60	10–12
Black and white		440–550	55–57		493–550	57–59		10–11
White	1931	660–770	68–75	63–67	484–572			10–12
Black, Black spotted	1938	616	64	65	435	58	55	10–11
Black, some white		528			440–484			10–11
White		550–660	65–67	63–65	440–550			10–12
do	1900	515	64		407	60		10–11
Black					286–330			7–8
Black spotted	1946	440–550	63–64	59–63	396–440			10–11
Black		616	64	66	445	59	58	10

was made of roots such as potatoes and sugar beets, green feeds of many kinds, and vegetable wastes of various kinds such as pumpkin, melons, and squash. Overall, the U.S.S.R. has a shortage of feeds high in protein and this was pointed out by nutrition specialists with whom the group visited in various regions of the country. It appeared to the group that they are also too deficient in cereal production to reach their 1965 production goals in pork production.

The group saw only one feeding experiment underway, although workers at several Institutes mentioned that they were studying protein requirements and the use of antibiotics. The experiment the group saw was a study of various levels of protein for growing pigs. These pigs were being self-fed. At all of the group's other stops pigs were hand-fed, and there was little evidence that self-feeders were or had been used.

Since the group's opportunity to observe research was limited, a check of recent abstract journals was made. Perhaps the following translated titles are typical of their present research (the group's conversations with people working in the Research Institutes indicate that they are): Silage for fattening pigs; Influence of green feed and silage on fattening pigs and jelly content of hams; Replacing imported minerals with wood ash; New methods of using blood in feeds; Azobacter and biomycin in pig husbandry; Preparation of liver and spleen as growth stimulants for young pigs; Use of biostimulants for feeding pigs; Antibiotics in pig husbandry; Rational use of protein for fattening meat pigs; Fattening pigs on food residues; Whey as a protein supplement to low protein rations; Combined silages for fattening pigs; Blood phosphorus in relation to diet; Increasing the milk yield of the sow; Influence of low temperature on the rearing of pigs; Fattening pork pigs on rations with different amounts of corn cob silage; Dynamics of gastric secretion in the pig with different kinds of feed; Age characteristics of salivary secretion in young pigs; Influence of limestone on the metabolism and growth of pigs.

Rations being fed at places the group visited included:

At a Collective Farm: A mixture of cull potatoes, timothy and clover meal, screenings, ground oats, and bran. This mixture was cooked and fed until the pigs reached a weight of 110 pounds after which they were fattened on city garbage.

At a Research Institute Farm: 2¼ to 4½ pounds per pig per day of a mixture of 60 percent barley, 15 percent oats, 17 percent wheat bran, 5 percent soybean oil meal, 2 percent fish meal, 1 percent meat meal, and trace minerals plus 1,000 IU vitamin D and 10 mg. antibiotics per 2.2 pounds of mixture. The pigs were also fed about 1 quart of skim milk per head daily, steamed potatoes and hay meal.

Study group examining self-feeder for hogs—Animal Husbandry Research Station, Teresino.

At a Collective Farm: A concentrate mixture of barley and sunflower seed oil meal and skim milk. They also fed corn silage and corn in addition during the winter and at other times substituted pumpkins, potatoes, and sugar beets for the silage. They were marketing their pigs at 8 to 9 months of age at a weight of 220 pounds. On slaughter, 60 percent classified as bacon and 40 percent classified as fat pigs.

At a Collective Farm: Sunflower seed oil meal was fed only to pregnant and lactating sows and young pigs. Weaned pigs from 2 to 4 months of age were fed a special ration composed of barley, oats, corn, sunflower seed oil meal and whey. Pigs over 4 months were fed 2.2 pounds whole oats (fed wet) and 15 to 18 pounds of cut green corn (whole plant) plus pumpkins or squash. In winter they feed corn silage, pumpkins, sugar beets and/or potatoes instead of the chopped corn. The potatoes are cooked for young pigs.

The group's impression was that brood sows were fairly well fed, but not overfed as is often the case in the Corn Belt of the United States. A special effort was made to feed young pigs well until they were about 4 months of age, though these rations often lacked protein of suitable quality. After the pigs were 4 months old, they were fed rations that were restricted in energy content and the rations usually included waste products, silage, and other green feeds. The most frequently cited age at marketing was 8 to 10 months at a weight of 220 pounds, which supports our observations with respect to the rations fed.

Pigs raised for bacon—collective farm, Latvia.

The severely restricted rations from 4 months to market were obviously carried to extremes at two collective farms that were visited, and resulted in severely stunted females. Many gilts were nursing litters of 3 to 5 pigs, and the gilts themselves weighed less than 200 pounds. Generally, litter size among the older sows was very good, as one would expect from the Large White breeding.

Management

The Soviet people obviously like their animals and take excellent care of them. Those persons, mostly women, caring for the swine were no exception. At several places the group met women who had been decorated by the government for their outstanding production records. For example, on a farm in Latvia the group met a woman who was said to have raised not less than 25 pigs per sow per year (2 litters) since 1952. Near Rubtsovsk the group met another champion swine raiser, a woman who raised 33 pigs from one sow in one year.

Swine production in the U.S.S.R. is inefficient in terms of labor. This is recognized by the Ministry of Agriculture and was commented on by the officials in our meeting with them. Most of the animals are hand-fed in small groups. Feed preparation takes much time because of the rations fed and lack of equipment for the job. The Russians apparently lack a well-organized feed manufacturing industry and they seem to have a serious transportation problem. Each area attempts to be self-sufficient in formulating rations with the feeds at hand. In the area near the Caspian Sea, for example, fish meal is fed to all species of livestock. In other areas the best supplement available is sunflower seed oil meal or cottonseed oil meal. A good feed industry and improved transportation would make it possible to place products, such as fish meal, where they would be most useful nutritionally.

Swine diseases seem to be well controlled. The group saw one herd in which gut edema seemed to be present. We observed scours in baby pigs in several farrowing barns. Rhinitis was quite severe in one herd, but was not observed at any other location.

Poultry Production

It was not the purpose of this animal husbandry study group to look into the poultry industry of the U.S.S.R. However, it was possible to visit a few poultry enterprises on collective farms, to see the poultry exhibit at the Moscow All-Union Exhibition, and particularly to visit the Ukrainian Research Institute for Poultry, a few miles out of Kharkov. The comments included here will be confined largely to observations made while at this institute.

Poultry raising in the U.S.S.R. is not confined to chickens and turkeys. Ducks and geese are very important in the poultry meat and egg supply. Both duck and goose meat are popular with the Russian consumer. It is suspected that in the less well-to-do families, especially in the country, they are the mainstay of meats.

Production of specialized broiler meat was not much in evidence, but on numerous occasions important people stated that the government is about to push heavily the development of broiler production. Production of poultry appears to be receiving increased attention as an additional source of meat.

The best estimate obtained of the production of poultry meat is about 2 billion pounds. The Vice Minister of Agriculture stated that by 1965 they intend to produce 5 billion pounds. He further stated that the choice of meat by the Russian people is as follows in this order: poultry, mutton, beef, and pork. The best estimate the study group could obtain on egg production in the country is about 20 billion.

There are 21 recognized breeds of chickens. The breeds listed in a brochure made available to the study group are as follows: Russian White, Zagor White, Moscow, Zagorsk, Leningrad White, Kuchin, First of May, Yurlov, Liven, Ukrainian Black, Nizhnedevits, Ukrainian Clay, Sussex, Ukrainian Ushank, Rhode Island Red, Ukrainian Zozulyast, New Hampshire Red, White Plymouth Rock, Barred Plymouth Rock, Poltava, Australorp. The Russian White, White Ukrainian Ushank, Poltava, White Plymouth Rock, New Hampshire Red and Rhode Island Red, and Australorp appear to be the most popular. The new Leningrad White developed by Mr. Sokikov at the Poultry Breeding Institute at Leningrad is receiving attention. This is the breed that is reputed to have been developed by vegetative transfusion, by introducing blood of the large Australorp breed into the White Leghorn. By following this procedure through four generations, it is claimed that the resulting white bird, resembling the Leghorn but as large as the Australorp, lays eggs larger than does that breed and has the laying ability of the White Leghorn. The Leningrad Institute has about 20,000 birds, but they indicated that they are not sure yet how stable the strain has become.

The breeds of ducks mentioned are the Ukraine (a new breed), Zerkal, Pekin, and the Black White Breasted. Twelve breeds of geese listed are: Kolmogora, Kaluga, Pskov, Shadrinsk (Ural), Arzamas, Romensk, Large Grey, Lithuanian, Komogorsk, Sunny Mountain, Pereyaslavl and Toulouse. The most common geese were the Toulouse and the Kolmogora. The three breeds of turkeys are the North Caucasian, Tikhoretsk, and Moscow White. The Russians did not appear to be interested in a small-type turkey.

Poultry raising is popular with the collective farm members; most of them raise chickens, ducks, or geese on their small plots of land. On some of the collective farms, poultry ranged freely or were out in small colony houses. On others, such as the poultry unit on the Lenin Collective Farm at Essentucki, in the Stavropol Department, a large poultry operation was housed in modern buildings where the caring for layers was well mechanized. In one house 20,000 layers were kept in individual metal cages and feeding and cleaning were nearly completely automatized. One

Chickens and chicken houses—Red Partisan Collective Farm, Leningrad.

person takes care of an average of 3,500 birds, doing all the feeding, cleaning, and egg collecting for that number. There were two such houses on this farm. The average lay was 138 eggs per year according to the chairman. The modern hatchery (American-type incubators) was for 138,000 eggs. The chickens were the Russian White breed. They start laying at 6½ months of age and weigh at that time about 3.3 pounds. The mature weight is about 5.5 pounds.

Large numbers of ducks and geese were raised on this farm. The study group saw one flock of ducks maintained near the piggery with a large artificial pond nearby. These ducks depended on scavenging for much of their food but were fed waste from the swine-production enterprise.

The Ukrainian Research Institute for Poultry near Kharkov, an affiliate of the Ukrainian Agricultural Research Institute, operates two large farms in connection with their research and development activities. One of these farms is in the Crimea. The bird population, as reported by the Director, Professor N. V. Dakhnovsky, is 60,000 chickens, 70,000 ducks, 20,000 geese, and 2,000 turkeys.

Experimental poultry house—Ukrainian Research Institute for Poultry, Borki.

The technical staff of this institute numbers 39 experts in breeding, physiology, and nutrition and management. The work is organized in the departments of breeding, nutrition and management, zoological hygiene, mechanization, economics and management; and laboratories of incubation, physiology, and biochemistry, and of feeds from both natural and water sources.

In breeding research, work is underway for improving egg production and for developing broiler strains for meat production. In the former, the Director indicated that the breeding methods were a modification of those used by Hyline Farms in the United States. Among the breeds were the Russian White, Ukrainian White, Paltova, New Hampshire Red, and Rhode Island Red. Inbred lines (30 or 40 such lines for all breeds) are developed for use in line crossing, crossbreeding, and reciprocal line crossings, with intensive selection to attain the objectives sought. The objectives are to improve growth, egg production, egg quality, fertility, feathering, and vitality. The experimental birds looked large, thrifty, and productive. Procedures and methods, including trap nesting, were not unlike those in the United States.

At this station new emphasis is being placed on developing strains and breeds for broiler production and to develop the broiler industry. Breeds, some of which were from eggs imported from the United States, are New Hampshire, Plymouth Rock, White Cornish, and Potalsky. Here they are trying to improve size and develop high growth rate, high feed efficiency, and good meat quality. Studies relating to poultry meat are underway.

In the nutrition and management department, work is in progress on the composition of feeds, the compounding of more effective laying and broiler rations, and on intensive egg or broiler production of birds in confinement on deep litter. Feed is offered generally as a wet mash instead of dry or in pelleted form, and they believe this is important. They also believe in the necessity of natural feeds, especially green feeds which are mixed into the mash. Skim milk, vegetable wastes, and green feeds such as onion tops, are mixed with grains and byproducts in the mash. One type of feed highly prized is silage made from a mixture of 60 percent ear corn, which is in the milk stage and includes the husks, and 40 percent carrots. This mixture, chopped and fermented to silage, contains 0.35 feed unit and 40 micrograms of carotene per gram (a feed unit is equal to the energy in 1 kilogram of oats). The silage has a moisture content of 65 to 75 percent and a pH of 4.2. This silage is mixed with other feeds in the mash. The Director indicated that the American feeding system, which he observed while in the United States in 1953, was not suitable for Russian conditions.

Considerable work is being done at this station on developing mechanization of poultry production. An automatic feed mixer was demonstrated; the dry concentrate mix, silage, vegetable wastes, greens, and water were added manually and automatically mixed together and delivered to a combination three-stage feeder and egg collector which was operated by one person. With the aid of this equipment one person could care for 6,000 laying hens. The apparatus impressed the group as being in the "Rube Goldberg" class. One

person stated that the objective in mechanization and housing was to achieve a plan whereby one person can care for a flock that will produce 1 million eggs per year.

At the laboratory for physiology and biochemistry, the study group saw interesting work on the metabolism of energy, protein, and minerals in chickens and ducks as related to age and production. This work was being done with a homemade closed-circuit respiration chamber. Energy requirements of both chickens and ducks in the embryonic stage were being compared to those for growth and for mature birds. The researchers were also measuring the temperature inside the egg and the embryo and the gaseous exchange of eggs at different stages of embryonic development. Measurements also were being made of the metabolism of protein at three growth rates of chickens as determined by level of feed intake. The workers were also interested in the thermal regulation of young chicks and ducks. Their results indicated that the thermal regulation in poults develops slower than it does in ducks, and therefore ducks are better able to adapt to environmental temperatures at hatching time. They are more mature at hatching and have a faster metabolism. This appeared to be very good basic research work.

The incubation laboratory was studying methods for increasing hatchability of eggs. A variety of kinds and sizes of incubators maintained under different conditions were available for this work.

Turkey research was concerned with increasing egg production and hatchability. Studies were being made of effect of environmental conditions, such as light and temperature, on initiation of egg production, number of eggs laid, and fertility.

They are hoping that by use of artificial light they can initiate egg production in December rather than the usual period of May, thus lengthening the laying season and increasing the number of eggs laid per hen.

This station is conducting research on ducks and geese. They indicated that in the Ukrainian Republic alone 50 million ducks are raised. As a part of this work the laboratory of feed resources is surveying the rivers and ponds as sources of feed for ducks and geese. Efforts are being made to develop additional sources of feed from these water areas.

At this institute, like many others visited, a large building program was underway. As an example, the group saw under construction a new laying house about 500 feet long and 46 feet wide to house 12,000 birds. This building will be fully automatic and will have facilities for individual trap nesting.

Pasture and Forages

Pasture and forage crops are important in a livestock economy. Cattle and sheep, particularly, depend on these kinds of crops for the major supplies of feeds. This is true in the U.S.S.R., where most of the tillable crop land has been needed to grow food grains. The animal husbandry study group, therefore, was interested to learn as much as possible of the kinds, amounts, and quality of the pastures and forages.

Sown Forage Crops in the U.S.S.R.

Although the group was not given an account of the forage crops of the country as a whole, they observed crops in many locations, and were given statistics on most of the farms they visited. In contrast to the United States, where sown pastures are generally recognized as one of the most economical sources on farms of feed for livestock, the impact of economics has not exerted a similar influence in the U.S.S.R. Only in Latvia were sown pastures given high priority. Latvian pastures are discussed later in this section.

The common pattern of feeding cattle in the U.S.S.R. in the summer consists in the daily harvest of some green seeded crops, which is hauled to the livestock and manger fed. This method has been successful not only because it favors the animal and leads to a maximum production of milk or meat, but also because labor is so cheap.

The crops that are grown, and fed green during the summer, or preserved as hay, silage, or stored roots for winter feeding, depend on local conditions, which, in a country so large, vary greatly. The principal forage crop in the U.S.S.R. must be the natural grass, of which they have a great deal, but the group saw very little evidence of use or management of this resource for the large herds of cattle or sheep on state or collective farms. However, the group did not see range sheep operations in either the Ukraine or Khazakhstan, where grazing on extensive areas of arid range land must be almost the only source of feed. In the Ukraine, range sheep were on extremely overgrazed range, dominated by *Artemisia austraica*, and the group had the impression that all livestock under such conditions were given considerable supplementary feed. The natural forage resource of the country, so evident in the more humid parts to plane travellers, is probably extensively utilized by the collective farmers in caring for their own limited livestock.

Approaching Leningrad by train, the group observed many small stacks of grass hay, cut with a scythe and stacked around a stake, or sometimes in stacks 6 to 8 feet square and 6 to 12 feet high, covered by a two-slope roof for protection, and sometimes on some sort of raised floor, evidently also for protection from water.

A schedule of crops produced, and periods when fed, for the "New Life" collective farm 200 kilometers south of Moscow was shown at the Exhibit in Moscow, and is as shown below:

Rye—May 15 to June 10; clover—June 11 to July 8; corn with field peas—July 9 to July 30; oats with field peas—July 9 to July 30; corn with field peas—July 30 to August 15; corn with field peas—August 15 to September 15; Alsike clover—August 15 to October 25; native pasture—August 15 to October 25.

In areas as far north as Moscow, corn is used less, and rye and wheat, grown in mixture with vetch, is important. These crops are harvested and fed green on some modification of the above schedule.

Red clover is the most important single sown forage crop in the U.S.S.R., and its area of greatest use is in the central, mountain, and black soil parts of the country. On the Lenin collective farm near Moscow, the Chairman, in telling the group of the improvement in agriculture following the collectivization movement, said that where formerly red clover (with grasses) yielded less than 1 ton per acre, yields now are 1.6 to 2.0 tons per acre. Alsike and white clover are also grown in the colder and wetter parts of the country. In the northern half of the country vetch is extensively sown, in combination with cereals, and it is probably the chief legume. Timothy is very commonly grown with red clover. Alfalfa (the Russians call it lucerne) is also grown in southern Latvia. In its more northern range, alfalfa is commonly grown with timothy, or with fescue in the northern Ukraine, while in the southern Ukraine it is grown with *Agropyrons*.

Alfalfa is grown throughout the Ukraine, Kazakhstan, and areas in between. It is grown as far north as Moscow where Lysenko showed the group a field of common (purple-flowered) alfalfa which he said would yield 3.1 to 3.6 tons per acre. It was growing in association with timothy. This field was in its third year, and had been fertilized by his compost method[1] each fall after the last harvest or in the spring before growth began. In the southern Ukraine where alfalfa and crested wheatgrass are grown together the mixture is good for about 4 or 5 years.

Another crop grown extensively for feed in the Ukraine is sudangrass. In central Ukraine it can be mowed for green feed or hay three times and then pastured. The group observed sheep grazing a field of sudangrass near Kharkov. In this region sunflowers are grown for seed, for oil. The stalks are used for fuel, and after the seeds have been extracted, the heads are fed to sheep.

At the Askaniya Nova station, sorghum hybrids are grown extensively, as well as field peas with sudangrass, the peas reportedly increasing the protein content of the sudan by 1 percent. Both blue and yellow flowered alfalfa are also grown, and alfalfa is reported to be more productive than sanfoin (this is *Onobrychis*, which the Russians call esparcet). Alfalfa is generally more productive if moisture is adequate to produce a good second crop. Alfalfa is normally sown on fallow land in June or July. It will yield 1.1 to 1.6 tons per acre. The group was told that alfalfa would yield 4 crops totaling 3.6 to 4.9 tons per acre under irrigation, though this is done only on experimental plots. Alfalfa in a good year may yield three crops but sanfoin never more than two. Under the natural precipitation, alfalfa ordinarily yields two crops, of which the first is best. An alfalfa field at the Askaniya Nova station had about 8 inches growth. Two crops had been taken, and the group was told this growth would be grazed off after it had cured on the stem, in order not to injure the plants.

In the Caucasus two types of sanfoin were grown. The European was described as a 1-cut type and the Caucasian as a 2-cut. In this area the 2-cut yielded 1.1 to 1.3 tons per acre while alfalfa yielded 1.6 to 1.8 tons per acre and vetch with wheat, when cut in bloom, 1.8 to 2.0 tons per acre. One-cut sanfoin yielded below all the above listed crops. In this area alfalfa gives three cuttings a year.

In the new lands area near Rubtsovsk the group saw a very good smooth bromegrass meadow, dotted with rather small hay stacks, being grazed by sheep. The hay is fed on the meadow to sheep during the winter. Under this management brome does well for 5 or 6 years.

Rather elaborate pasture systems reportedly in use in the U.S.S.R. were illustrated at the Exhibit in Moscow, but the group did not see them on any of the farms visited. One on which notes were taken at the Exhibit, is as follows, from a collective farm in the Moscow region: Twenty-one separately fenced fields are in a grazing rotation, as follows, for any one field:

1st 24 hours—cattle (milking cows)
2d daytime—heifers or dry stock
2d nighttime—horses

The milking cows are moved to a fresh pasture each day, and are followed by heifers and horses in turn. Each field was grazed 4 times during a season, for a total of 84 grazing days. The claim was made that with this pasture system milk was produced at a cost of 2 cents per pound, where formerly (presumably under the hand-feeding system) the cost was 6.4 cents. The recommended stocking rate was 100 to 110 milking cows or 150 to 180 beef or dry stock per unit of 10 to 15 acres. The claim was made that on such a system in the Volga region 121,000 head of cattle had gained 15,000 tons. For an 84-day period (it might have been longer) this is a gain of 3 pounds per head per day. This is very good, but not unreasonable, particularly if the cattle entered the study in poor condition. On the basis of 180 head of beef per 10 acres per day, the per acre gain per season of 84 days would be 216 pounds of beef. This is probably a good pasture although it depends on the proportion of the total feed consumed by the classes of livestock following the beef, if the system was followed as outlined.

At the permanent exhibit the group saw cabbage said to be adapted to cold regions; it was grown for silage. There was a hybrid between sunflowers and artichokes claimed to yield sunflower seeds and artichoke tubers (it had not headed, and the group did not dig around the roots, but it was very vigorous), and other forage plants, among them *Lathyrus*

[1] Lysenko's system for making compost is as follows:
In May: Mix together 300 tons fresh manure containing some straw; 20 tons tri-calcium phosphate; 30 tons crushed lime. Spread the mixture on 1.23 acres of land. Plow 6 inches deep. Cultivate deeply 2 or 3 times during summer.
In August: Use top 5 inches of soil as though it were fertilizer, and apply to 134 to 247 acres.
Lysenko claimed that each ton of this mixture was more effective as fertilizer than a ton of the original manure used.
The extent to which this fertilization system is in use in the U.S.S.R. is not known. It was not mentioned in the reports of the crops, soils, or agricultural economics teams.

tingitanus L. which was very much earlier than *L. sativa.*

Judging by the areas, crops, and soils that the group saw, the U.S.S.R. should have no trouble in increasing its forage production to help feed the increased numbers of livestock its program calls for. In doing this, it seems inevitable that they will place greater emphasis on improved pastures.

Sown Pastures in Latvia

Sown pastures are important in Latvian agriculture. The group was told that 36 percent of the total plowed land in Latvia was in clover and perennial grass pasture. The aim is to increase this to 45 or 50 percent.

Seeded pastures at the Research Institute of Animal Husbandry and Veterinary Science were shown by Victors Terauds and Anton Osols. The former is the author of a book on forages and a widely recognized authority. He said the following mixture is sown extensively in Latvia:

	Pounds per acre
Red clover	6–7
Timothy	7–9
Meadow fescue	13
Kentucky bluegrass	2¾

White clover is native to the area and does not require seeding. Red fescue and red top also are found everywhere without seeding.

Fertilizers are used very extensively on pasture as well as on other crops in Latvia. If the aim is to retain or increase the white clover in a pasture, the annual fertilization schedule is as follows:

	Pounds per acre
K	90
P_2O_5	180

In addition, 10 tons of liquid containing urine is applied per acre.

In Latvia, as in the United States and other countries, there are two schools of thought on the question of legumes versus heavy nitrogen fertilization. Where clovers are disregarded in the pastures, the following schedule is used:

	Pounds per acre
$(NH_4)_2 SO_4$	270
18% phosphorus	225
K	180

In addition, 15 tons of liquid containing urine is applied in split applications during the growing season.

To either of the above, 15–20 tons manure may be added each third year.

The pasture management system at the Research Institute involved 27 separately fenced fields, each grazed 1 day at a time in rotation throughout a grazing season of 150 days, from May 10 to September 30. They make either silage or hay, as the weather permits, from the extra spring pasture growth. Silage for winter feeding is made in Latvia from many crops—corn, sunflowers, artichokes, an oat and vetch mixture.

In late summer, pasture is supplemented with cut green grass fed at 22 to 44 pounds per cow daily. This practice begins in August and may continue through September. In addition, beginning about September 1, green corn may be added as a supplement to pasture. Clover and timothy are grown, and hay from natural meadows is also put up for winter feed. In the southern part of Latvia alfalfa is fairly important.

When weeds become a problem in Latvian pastures, they are mowed, sometimes twice each season. We observed a yellow-flowered annual weed, in some pastures so abundant as to lower productivity. The weed problem is probably intensified by their practice of keeping a sown pasture for 10 or 11 years. Even if the pasture were to maintain high production throughout this entire period, this practice falls short of the potential pastures have for benefiting the crops that follow. The group was impressed with the lack of erosion in Latvia, and it may be that keeping pastures down so many years is an effective means of erosion control on the light soil. Other reasons might be that seeded pastures may be difficult to establish, or the seed cost may be high, or the loss of full productivity during the seeding year may be felt.

Riga receives about 24 inches annual precipitation[2] of which over 13 inches falls during the 5 months May through September; July and August are the wettest months, with about 3.5 inches each. Riga has a mean July temperature of 64.8° F., approximately like Duluth, Minn., but the average January temperature, 24.3°, is about the same as at Lincoln, Nebr. With cool summer days (the maximum during 25 years was 92°) and long summer days in their latitude (57° N.), rainfall is highly effective in crop production, and the total precipitation and seasonal distribution at Riga are very favorable to high yields of many crops. The group saw excellent corn in this area, but were unable to verify claims of yields of silage as high as 31.5 tons per acre.

The fertilization (compost) system developed by Lysenko at Moscow, or some modification of

[2] Climate and Man, 1941 Yearbook of Agriculture (U.S. Department of Agriculture, p. 677).

it, was in use in Latvia, and recommended by Professor Terauds. He explained that when the compost was begun on May 10 and applied at 10 tons per acre on July 19, this land produced 2.5 times more green mass of plant growth in 3 weeks than did an adjacent unfertilized area.

Fodder corn—New Lands Region, Land of the Soviets Collective Farm, Rubtsovsk.

Making corn silage in trenches—Animal Husbandry Research Institute, Kharkov.

In Latvia, the Research Institute of Animal Husbandry and Veterinary Science is responsible for meadows and pastures. The Institute of Soil Tillage cooperates, as does also the chair dealing with field crops in the Latvian Academy of Science. Research is in progress at experiment stations on both seeded and natural meadows and pastures relative to yields, soil classification, moisture content of the soil, biological characteristics of the main meadow grasses, recovery after harvest, and chemical composition.

The Minister of Agriculture said that one feeding unit from pasture costs 0.8 to 1.2 cents. From clover hay the cost was 2 cents, and from all other crops much higher. Fifty-two percent of the production cost of milk was in the feed.

Corn and Silage in the U.S.S.R.

As indicated in table 18 (appendix) the Russians are in the process of greatly expanding their acreage of corn, primarily for silage. Observations of the study group at several locations indicated that this expansion is amply justified. The group saw many good fields of corn, though often yields claimed seemed difficult to accept. They also saw many quite ordinary fields. Corn is cut for silage when less mature than is normal in the United States (as high as 75 percent of moisture), and also their fields are planted primarily on about a 27.5-inch spacing. In the more northerly parts of the U.S.S.R. where precipitation is sufficient for corn production, the growing season is short and early maturing strains are required. At the permanent exhibit at Moscow, the forage garden contained a strain of corn claimed to be cold hardy and adapted to the cold spring season of the Moscow region.

Academician Lysenko showed the group a corn variety he had developed which he stated would yield 32 to 48 bushels per acre (dry grain). He developed this variety by ordinary selection, since he does not accept the genetic principles that have produced hybrid corn. He showed the group a field of corn being grown for silage, sown in hills with 27.5-inch spacing, in which each hill was sown to two seeds of an early maturing variety and one seed of a late maturing variety. He stated the resulting "competition" between early and late led to yields above those obtained from either variety when grown alone, and equal or superior to hybrid corn. The ratio of early to late per hill is not fixed.

On the Lenin collective farm near Moscow yields of corn silage were claimed to be 20 to

22.5 tons per acre. They had used sprinkler irrigation and had introduced manure water into the system for fertilizer.

On the Red October collective farm in Latvia, corn for silage was claimed to yield 17.8 tons per acre and as high as 31.5 tons. This was corn produced by the All-Union Institute of Plant Breeding at Leningrad identified as *Vir-25*. Latvia has 24 inches of precipitation with half or more falling in the summer. The season is too short to mature grain.

In the Ukraine corn is extensively grown, and, where moisture is adequate, with a legume such as soybeans to increase the protein in the feed. At Askaniya Nova in the southern Ukraine, S. P. Kaplonovsky told the group corn grown there was 60 percent for silage, 25 to 30 percent for green feed, and the remainder for grain. Silage is made when corn reaches the milk-wax stage. They are now shifting from a spacing of 27.5 x 27.5 inches to 40 x 27.5 inches to get "larger plants." The principal variety is designated *Vir-42*. Kaplonovsky showed a chart listing a number of varieties obtained from the United States and some of their own. They have recently undertaken to produce hybrid corn, and the group saw a field with blocks of de-tasseled rows, but most hybrid corn used in their tests to date has been imported.

His chart included:

> Pioneer 373 (134 days for silage)
> Pioneer 388
> Russian hybrid Borbuk 600 (129 days for silage) which was the highest yielder, 11.5 tons per acre.

On a collective farm in Georgia in the southern Ukraine, with 11 to 12 inches of precipitation, corn and some other crops are grown under irrigation. The group was told that corn was given three irrigations of 2 inches per irrigation. The soils here are brown but have a low water-holding capacity. Yields were not obtained for corn grown under these conditions.

At Stavropol, an agricultural region equal in size to the combined areas of Belgium, Holland and Denmark, 2.47 million acres of corn are produced. Figures on yields were not obtained, but irrigation is well developed and is expanding; and the season is long enough to mature grain. On the Lenin collective farm near Essentucki, 11,215 acres were sown to corn.

Corn was also grown at Alma Ata, where the Ray of the East collective farm last year had 1,660 acres, but in this region orchards on the plain between the mountains and the desert are damaged by frost, and this suggests that the climate is not ideal for corn.

At Rubtsovsk in the new lands region, the Egorevsk state farm (organized in 1954) grows 2,223 acres of corn for silage and claimed yields of 17.8 tons per acre. The corn looked good but in the same region on the Land of the Soviets collective farm where 3,705 acres were growing corn an estimated yield of 13.35 tons per acre appeared more realistic.

Besides corn, silage is made from a wide variety of crops, depending on local adaptation, including cabbage (possibly only experimentally), potatoes and beets in the Moscow area; artichokes, sunflowers, pasture herbage and oats and vetch in Latvia; and alfalfa, beet pulp, sorghum, and rye in the Ukraine.

In the U.S.S.R., silage is usually made in trenches or in stacks, sometimes between stacks of hay. The group saw only a few upright silos.

The Virgin Steppe

The Steppe in the U.S.S.R. has long been recognized as one of the great natural grasslands of the world. The group drove for miles through Steppe country at Askaniya Nova, a very flat, and naturally treeless country. Principal use of the Steppe here was for making hay for winter feed. However, after the hay crop has been put up, grazing is practiced. Hay is put up here during the first half of May. Haying operations are not as fully mechanized as on American farms. The group saw no balers or baled hay. The Steppe is not strongly dominated by grasses but contains a large number of broad-leaved herbaceous annuals and perennials. The more important forage plants are the following: *Stipa ucrainica, Agropyron imbricatum, S. capallata, A. cristatum, bromus tectorum, Medicago falcata.* In addition, on low lying areas with saline soils, adjacent to the Sea of Azov, the group saw *Artemisia austraica*, a blue-colored, perennial, low-growing shrub, of low palatability. This plant, growing to about the size and appearance of fringed sage *Artemisia frigida* on our northern plains, was claimed to have antiworm properties for sheep. In the more favored sites on the Steppe, *Agropyron pseudosesium* is common. *A. cristatum* was not observed at any place to be dominant on well managed Steppe. One overgrazed area near the Sea of Azov, which appeared to be dominated by *Artemisia austraica*, had as an understory a weak but persistent cover of *A. cristatum.* Farther from headquarters on this farm, where overgrazing was less pronounced, *Stipas* and a wide variety

of other species, as well as *A. cristatum,* were found.

In the vicinity of Askaniya Nova, the Steppe yields about 445 to 536 pounds of hay per acre. This is in a 12- to 14-inch rainfall belt, with dry summers. Experts on the Steppe at Askaniya Nova were I. A. Stepanova, a lady taxonomist, and G. M. Karasev.

The group was in the Steppe again in Rubtsovsk, in the new lands area, but here the better land had been plowed and the original vegetation was observed only in restricted or less desirable areas. The topography here was less flat than in other parts of the Steppe, and the vegetation included a coarse fescue resembling *Festuca arundinacea* and in places *Agropyron glaucum,* which is very harsh leaved and was generally ungrazed.

In contrast to Askaniya Nova, the rainfall comes primarily in summer in the new lands area, and although total precipitation is less, crop production appeared highly successful. The group was given the following rainfall pattern:

	Inches per month
January to April	0.3-0.4
May and June	0.8-1.0
July and August	2.0-2.3
September	0.8-1.2
October to December	0.4

This adds up to from less than 9 inches to just under 11 inches per year. However, 6 to 7 inches fall in the 4-month period May through August, with the last 2 months receiving more than double the first 2 months. This is almost perfect moisture distribution for such crops as corn and sugar beets, as well as alfalfa and bromegrass. The group was told that annual precipitation for the area was 14 to 16 inches. They claimed yields of sugar beets on this limited moisture of 8.3 tons per acre from 1,220 acres, and they hoped for 11 to 12 tons per acre from the 1959 crop. This seemed a reasonable estimate since examination of beet fields indicated that even though the beets were small the stands were excellent. On this same collective (Land of the Soviets) they claimed a 3-year average yield of 34 bushels per acre from 12,844 acres of spring wheat. An uncut grain field that we examined appeared equal to this average.

Arid Rangeland Improvement

Discussions were had with researchers interested in arid rangeland improvement at Stravropol and Alma Ata. At Stravropol the group met Basil Scripchinskey and A. A. Kornilov from the Stravropol Agricultural Institute and A. Dudar and N. I. Basov from the Sheep Institute; the last two were directly engaged in range improvement. An important problem on rangeland is the widespread occurrence of *Medicago minima,* an annual which produces a spiny bur that contaminates the wool of sheep. Killing *M. minima* with 2,4-D is rather easy (less than 1 pound per acre is effective) except that this species produces hard seeds, and the spray kills any other legumes present. They had seen a picture of an experimental model of a suction seed harvester (developed in Oregon—reported in Farm Implement News, 1957) and were very anxious to purchase this machine to use in gathering burs of *M. minima* from range land. In the same area *Stipa capillata* L. and *S. lissingeana* Trin. caused trouble with sheep because of the sharply pointed seeds penetrating the skin. *S. capillata* can be mowed before panicles are formed, and yields a good hay. *Agropyron cristatum* and *A. sibericum* are important here, the latter on sandy soil. *Kochia prostata* is a good long-lived forage plant on saline soils of this area. In more favorable situations *Medicago sativa* and *Melilotus* are sown.

Sandy rangelands containing a thin cover of *Agropyron sibericum* are improved by the following processes:

(1) Protection from grazing until seed is ripe.
(2) Scattering and covering the seed with a harrow followed by a roller.
(3) Complete protection the next year.
(4) Mowed high the second year, for hay.
(5) Ready for grazing the third year.

A recommended dryland mix for this region is:

Festuca sulcata
Kochia prostata
Medicago sativa
Agropyron sibericum
Agropyron cristatum

In more favorable locations they recommend the following:

Bromus inermis
Arrhenatherum elatius
Medicago sativa
Onobrychis sativa
Festuca pratensis

Sandy lands are generally reseeded in strips 13 to 18 yards wide, alternating with undisturbed strips, to prevent wind erosion.

Dr. Scripchinskey, a plant physiologist, understands and speaks English. He has com-

pleted one phase of a study in photoperiodism of forage grasses. He has demonstrated that *Lolium multiflorum* is not light sensitive whereas two varieties of timothy (*Agropyron repens* and *A. cristatum*), are. This study was the nearest to basic research with forage plants that the animal husbandry team observed in the U.S.S.R.

At Alma Ata at the Academy of Agricultural Science at Kazakhstan, forage researchers contacted were Vladimir Matveer and Grigory M. Polumiskoc. This province has 420 million acres of arid range (40 percent of the U.S.S.R. total) that in a dry year produces 133 pounds of forage per acre, and in a favorable year as much as 400 pounds per acre. Here the native range contains *Stipa capillata, Poa bulbosa,* and *Kochia prostata,* and *Agropyron sibericum, Kochia,* and alfalfa are generally seeded. Also in favorable situations sorghum and millet are sown.

The 420 million acres of arid range has an annual precipitation of 6 to 3.6 inches.

They reported precipitation and hygrothermal coefficients by seasons as follows:

	Precipitation(%)	*Hygrothermal coefficients(%)*
Winter	15–20	30–35
Spring	30	35–40
Summer	35	20–25
Fall	15–20 (uncertain)	15–20

Stacks of alfalfa hay with ventilators—Gorky.

Agropyron sibericum is fall seeded with about 14 pounds per acre, and the seed is covered 0.6 to 0.8 inch, or as much as 1.2 inches in dry sandy soil. Alfalfa is added in the spring. From this combination under the very arid climate it was claimed that yields of 1,300 pounds per acre for 5 or 6 years after this seeding was introduced into the virgin range. Observations made by the group seemed to verify these yields on limited acreages. However, the limited 6 inch annual precipitation, roughly, would allow for 1,000 pounds of water per pound of forage produced, approximately what alfalfa requires, only if all the precipitation was available to the plants. Under the high evaporation rates that exist in arid regions such as this, only a small fraction of the total preciptation would be available to pass through the vegetation. The experimental areas that the group observed could have had a water table within the reach of roots, but this is not likely to apply to 100 million acres. It is problematical that yields of this magnitude are realized over extensive areas in this arid region.

Production of dry hay from *Kochia prostata* for an 8-year period and mixed with *Agropyron sibericum* for a 4-year period was reported as follows:

	Kochia prostata Pounds per acre	*Kochia mixed with Agropyron sibericum Pounds per acre*
1950	1,400	
1951	1,520	
1952	1,600	
1953	2,020	
1954	2,056	1,500
1955	1,567	1,690
1956	1,477	2,136
1957	566	392

Kochia prostata is sown in 6-inch drills and the seeds are covered only 0.2 inch. Seedings are productive for 13 years.

They reported that of the 420 million acres of arid range, 100 million could be seeded to *A. sibericum* and *M. sativa.* However, this has not yet been done, but plans have been developed for seeding 12.4 million acres near Alma Ata. The group flew over this desert region when approaching and leaving Alma Ata and it appears from the air to be as arid as the precipitation data indicate.

The group was unable to examine the range on the ground and hence has no basis for evaluating range forage production.

All Union Institute of Plant Breeding—Leningrad

Collection, dissemination, and testing of seeds of forage crops is a function of this institute. This work is under the direction of Dr. M. A. Shebalina, who had a chart listing 53 forage species and a total of 13,078 seed lots collected. The principal ones were as follows:

Species	*Number of Collections*
Trifolium pratense	2,541
Medicago sativa	2,221
Phleum pratense	883
Trifolium repens	475
Dactylis glomerata	414
Bromus inermis	321
Agropyron spp.	332

They receive between 8,000 and 10,000 samples of forage plant seeds per year, from 50 countries. In 1958 they received 102 lots from the United States and they sent 148 in return. Many more lots are exchanged with countries like Canada and Sweden.

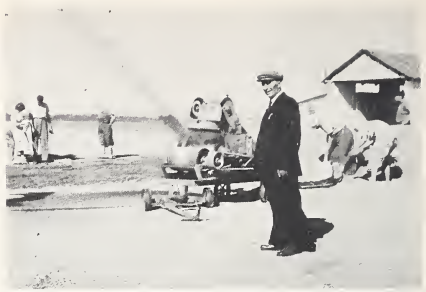
The chart listing 53 species did not include *Elymus junceus* and the group learned later that it is found in southeastern Siberia where it is not important. The list did include *Roegneria fibrosa;* this name had been noted in a grass garden at the Exhibition of Economic Achievement at Moscow. It was almost certainly an *Agropyron,* and upon inquiry the group was told that the taxonomy of the *Agropyrons* was not yet fully worked out. They are working on it.

What we speak of as the physiology of a plant, the Russians call biology. They put great stress on understanding the biology of forage plants in order to apply proper management. They are interested in fall bud development as an index to next season's growth.

The group was told that crested wheatgrass was being studied by Professor Kosarev at the Kinell Station, Rujbishev district, where studies included root and shoot formation, reaction to day length, and rate of growth. Agropyrons are also being studied at the Krasnakutsk station in the Saratov district.

M. M. Jacubziner, in charge of wheat breeding, told the group that wheat x *Agropyron* hybridization had contributed disease and frost resistance to annual wheats. In searching for greater drought resistance in wheat they had tested many lots from arid parts of Africa but local varieties were superior. Smut and rust resistant wheats came from South America. The wheat laboratory has a collection of 20,000 specimens gathered from all over the world. About 50 varieties are important in Russia. They have published six indexes of wheat classification, and in 1958 a large monograph on wheat of the U.S.S.R. The second volume of a large series on flora of the U.S.S.R. dedicated to wheat, is now in process of publication. They have published a small volume on the wheat of the United States. In addition to frost and drought resistance, Russian wheats were said to be very high in protein.

Wheat ready for harvesting—New Lands Region, Rubtsovsk.



Cleaning wheat grain—New Lands Region, Egoresk State Farm, Rubtsovsk.

Perennial wheats are still in the experimental stage. Professor Tzitzin, formerly the leader in wheat x *Agropyron* research, is now director of a botanical garden in Moscow near the Exhibit where he has continued his hybridization work. The present leader in wheat x *Agropyron* hybridization is Professor Badovsky. The group was told the Russians are presently much interested in a cross between *Triticum durum* and *Secale kuprijanovi,* the latter species being found only in the Trans-Caucasus, the center of origin of the cereals. The hybrid is perennial.

Director of the Institute, Professor I. A. Sisou, asked many questions about sugar beet culture in the United States. His office wall held a large portrait of N. I. Vavilov. When asked about the Vavilov vs. Lysenko controversy, he said simply that it was good to have these differences of opinion, and only with them is progress possible. At the present time, he told the group, both points of view are followed, depending on the people.

The institute has a rather comprehensive and exceptionally well managed library, which was notable in that the librarian spoke and read English fairly well and the coverage of American plant breeding literature appeared exceptionally good.

The visit to the All-Union Institute of Plant Breeding was not on the group's originally accepted itinerary and required some effort to arrange. Miss Inna Afonicheva, who had interpreted for the group at the Institute of Zoology two days before, served as interpreter also during this visit.

Feeding and Nutrition Research

Nutrition Research

The study group was shown the nutrition research facilities at the following places: All Union Academy of Agricultural Science, Timiryazev Academy, Moscow; Animal Husbandry Research Institute, Moscow; Pushkin Agricultural Academy and Laboratory for Animal Multiplication, Pushkin; Institute of Animal Husbandry and Veterinary Medicine, Riga, Latvia; Animal Husbandry Research Station, Teresino, near Kiev, Ukraine; Animal Husbandry Research Station, Kharkov, Ukraine; Ukrainian Research Institute for Poultry, Kharkov; Askaniya Nova Research Institute, Ukraine; Stavropol Agricultural Institute, Stavropol, Russia; and the Academy of Agricultural Sciences, Alma Ata, Kazhkstan.

In general, all the laboratories contained sufficient equipment for the routine chemical analyses of feeds. Many laboratories had special equipment for vitamin and mineral analyses. In several laboratories new colorimeters and spectrophotometers were in use. Many of the scientists at the Nutrition Research Laboratories were familiar with the usage of isotopes in animal nutrition research in the United States and Western Europe, but most did not have facilities for such research at this time; however, such facilities, we were told, were either under construction or were being planned.

The study group visited a radiochemical laboratory at the Timiryazev Academy. This laboratory was available to all disciplines at the institute for research, but the greatest emphasis was in the training of agricultural scientists in the usage of radioisotopes in their research. As the animal research work was in a separate laboratory, which the study group did not see, all active research here was being conducted with plants. The laboratory was well equipped with gas-flow, proportional, Geiger-Mueller, and solid scintillation-type counters; but liquid-scintillation counters had not been used as yet. Neither has tritium been used in that laboratory. The group was told that radioisotopes were being used in animal nutrition research in the same ways we are using these in the United States. The study group, however, was unable to make first-hand observations on the usage of isotopes in animal research or to visit with scientists who are actively engaged in this type of animal nutrition research.

Based upon observations and visits with Soviet animal nutritionists at the various research stations visited by the study group, it appears that most of the animal nutrition research in the Soviet Union is applied research. It was suggested that the more basic nutrition research was being conducted at the Biophysical Institutes. The study group did not visit any of these institutes.

In general, Soviet nutritionists seemed to be tied in closely with present-day production of animal products. They were aware of the research in Western Europe and the United States and seemed to be most concerned with application methods as well as the testing of products under their conditions. Actually, the same impression could be obtained should one visit some of the nutrition laboratories in the United States. As there was some confusion regarding the purpose and composition of the study group, it is possible they were not shown any of the basic nutrition laboratories. The Soviet nutritionists were interested in and asked many questions about the following: (1) Use of radioisotopes in mineral nutrition studies; (2) use of isotopes in rate of metabolism studies; (3) fatty acid utilization by bovine tissues and whole animals; (4) non-protein-nitrogen utilization by ruminants; (5) effect of such pigment glands as gossypol on protein quality in ruminants; (6) amino acid imbalance studies; (7) unknown growth factors in such products as yeast; (8) urea toxicity; (9) trace mineral studies; and (10) in particular, mineral imbalance studies.

Several laboratories were actively engaged in research on the physiology of the various factors affecting patterns of fatty acids produced in the rumen. The Soviet nutritionist, as is his counterpart in the United States, appears to be aware of his dependence upon the more basic fields, such as chemistry, physics, mathematics, chemistry, and physiology, in the practice of his profession. Actually, as covered elsewhere in this report, he might be better trained in these basic sciences, at least at the undergraduate

level, than is his counterpart in the United States. If this is true, it is possible that they will be putting more emphasis upon basic research in the future and it will be interesting to watch the developments in this field.

Feeding Livestock

The study group was able to discuss the feeding of livestock with many people on collective and state farms and at the various research centers. As in the United States, details of feeds and feeding practices vary between farms within a given section of the U.S.S.R. as well as between major sections of the country. All sections, however, use the "feed unit system," in which the unit is 1 kilogram of oats. In principle, their feed unit system corresponds closely with the Scandinavian feed unit system (in which the unit is 1 kilogram of barley), and is well-known in the United States. Certain other generalities can be made and these are discussed under each class of livestock.

Dairy Cows

In the northern humid areas, animals are allowed to graze in permanent pastures during the summer months. In addition, the cows are given a grain mixture containing about 15 percent of crude protein, the level of protein being varied to meet the changing composition of the pasture forage. Various feeds are included in the grain or concentrate mixture and include some or all of the following: Corn, barley, oats, various mill feeds, beet pulp, beet molasses, sorghum grains, flaxseed meal, cottonseed meal, sunflower meal, and urea.

In all other areas, animals are kept confined in barns or small lots during the entire year. Chopped green feed, when available, is hauled to the animals. Green feeds include alfalfa, sweet clover, sudan, millet, corn, sorghum, sugar beets, etc. Also such items as squash and pumpkins, when the supply is in excess of needs, are used. In the winter season, silage replaces the green feeds and corn is the silage of choice. As the growing season is short in the northern areas, corn is ensiled prior to the formation of ears. In every section, grain levels were varied in accordance with milk yields, averaging about 1 pound of concentrate per 3½ to 4 pounds of milk.

In the hotter and drier sections, such as the Southern Ukraine and Southern Kazahkstan, there was a tendency to feed higher levels of grain. The use of urea is increasing in many parts of the U.S.S.R. One of the most popular ways of using urea was to mix 7 kilograms of urea with a ton of green corn when this is blown into the silo. The utilization of urea seems to be greater in the Eastern Ukraine and in the Stavropol than elsewhere. In general, urea was included in a grain mixture similar to the following, in percent: Corn, 50; wheat bran, 15; urea, 3; sunflower, flaxseed, or cottonseed meal, 32. Also there was much interest in the use of urea-molasses mixtures in feeding dairy cows.

Dairy Calves

The calves are allowed to nurse on their mothers for 3 days and are removed to separate areas. They are fed whole milk until they are about 1 to 2 months of age and are then given skim milk plus a calf starter. The calf starters contain fish meal, blood meal, and grains, plus a vegetable protein supplement. Hay is also offered when the calves are about 2 months of age. The young calves are allowed on pasture for green feeds, if available, early in life and skim milk feeding is continued until the calves are about 6 months of age. After they reach that age, they are fed mostly pasture crops, chopped green feed, or silage. Most groups include an antibiotic in the rations of young calves. Several of the farms reported that it required 130 to 180 pounds of whole milk and 450 to 550 pounds of skim milk to feed a calf up to 2 months of age. They report that very little grain or hay is consumed before the calves are 2 months of age.

Some of the bull calves are used for veal production; however, in order to increase the supply of beef, many bull calves are now being kept as bulls until they reach 500 to 600 pounds, at which time they are slaughtered for beef. If forage quality is good, not much grain is fed to the bulls during the growing-fattening period. The study group was not able to obtain much general information on beef cattle fattening practices, and had the impression that the animals are never carried to a high degree of fatness or finish as in the United States. While visiting the Stavropol Agricultural Institute, however, the study group was told that cattle were being fattened in this region. These cattle were mostly young dairy bulls and culled dairy heifers; and the ration consisted of crushed milo, free choice, plus cottonseed meal, alfalfa hay, minerals, and an antibiotic. The study group did not visit any feedlots in which such animals were being fed.

Mature Dairy Bulls

In the northern humid areas, bulls are kept on good permanent pastures during the summer and in barns during the winter season.

Most of their nourishment comes from pasture or chopped green feed in the summer and silage during the winter season. Concentrates are fed as supplements to the forage. The level and composition of the concentrate mixture are varied in accordance with the quality of the forage; the primary aim is to keep the bull in a thrifty condition and to prevent the animals from getting too fat or too thin.

Brood Sows

The collective farms located near the cities use much garbage in their swine-feeding program. The study group visited several farms in which garbage was the main source of feed. The Soviets reported that, on the average, 9.9 pounds of garbage is equivalent to 2.2 pounds of oats. Concentrate feeds and roughages are used to supplement the garbage.

Other farms not having a supply of garbage allow the sows to graze primarily on pastures during the summer months. Usually a single grain, such as barley or oats, or a mixture of grains, is used to increase the energy content of the rations. During the winter season, the sows are given a special corn silage made of chopped corn ears ensiled in the milk stage. This silage replaces pasture or green feed or both and is supplemented with grain or cull potatoes and a protein supplement. Squash, pumpkins, waste fruit, vegetables, and similar feeds from the farm are also given to the sows when available.

Growing Pigs

The study group found that methods of feeding pigs differed widely between the major areas relative to specific feeds used; however, the principles of feeding were the same. From birth until the pigs are 8 to 9 weeks of age, they are allowed to suck on their mother and are given a starter composed of some or all of the following feeds: Barley, oats, wheat bran, soybean meal, fish meal, whale meal, meat and bone meal, minerals, vitamins A and D, and antibiotics. The crude protein level was about 20 percent. If garbage is available, the pigs are continued on the grain mixture and in addition given green feed until they weigh about 100 to 110 pounds. At this time, garbage plus a concentrate mixture is fed. As in the case of the sows, they find that 9.9 pounds of garbage is equivalent to 2.2 pounds of oats. They have tables for estimation of animal requirements for the various nutrients as well as an estimate of the amount of garbage the pigs of different ages will consume; therefore, are able to vary the level of concentrate in accord with the rate of growth desired. As the pigs grow older, their capacities for garbage consumption increase and the levels of concentrate feeds are decreased. In many cases, cooked culled potatoes are fed in place of some or all of the grain in the concentrate mixture.

As the dairy industry in the most isolated areas concentrates on the production of butterfat, which is shipped to the large cities for processing, the supply of skim milk is plentiful. On many collective farms, the pigs are fed a mixed feed plus 1 liter or more of skim milk per day. Whey is also used on many of the collective farms. Dehydrated hay meals, particularly alfalfa, are also being produced now and are included in some concentrate mixtures at levels of about 5 percent of the mixture.

On one farm, the study group saw them using cull potatoes, timothy screenings, clover screenings, ground oats, and wheat bran in a mixture that was cooked before it was fed. There was evidence that they know the nutritive requirements of their animals quite well; therefore, were able to change from one ration to another quite easily on the basis of nutrient contents of the rations. Protein levels, as in the United States, are reduced as the animals grow older. Trace minerals and antibiotics apparently were added to rations in every section visited by the study group.

On farms not having city garbage, the pigs are given chopped green feed as soon as they will eat it, and the amount is increased as the pigs grow older and have greater capacity. Mixed feeds, similar in composition to those described earlier, are given to supplement the forage and in an amount to keep the pigs growing fairly rapidly. In the winter, a special ear corn silage (see brood sows) replaces the green feed. Pumpkins, squash, waste vegetable products, etc., are also used when available.

Mature Boars

The major part of the diets of the mature boars is roughage in the form of pasture, chopped green feed, or silage. A concentrate feed is used to supplement the deficiencies of the roughage and is fed at a level to maintain the boars in a thrifty condition. Garbage is used as the main source of nutrients on some farms and concentrate feeds are used to supplement the garbage. On many collective farms, alfalfa hay is the main roughage for boars during the winter season. The major emphasis in the feeding of mature boars, on all the farms the study group visited, was to keep the animals in a thrifty condition during the breeding seasons.

Sheep

The feeding practices in the Southern Ukraine seem to be similar to those used in other sections visited by the study group. All animals are kept on pasture during the pasture season. If the pasture is poor (it was in the summer of 1959), the animals receive alfalfa hay, plus one-half pound of grain daily. In the winter season, each pregnant ewe is fed 3.3 pounds of silage, 4.4 pounds of hay, one-half pound of grain, and whatever green feeds are available. During the last one-third of pregnancy, the grain level is increased to nine-tenths of a pound per day.

New lambs are given one-half pound of grain per day and allowed to nurse their mothers. The idle ram is given seven-tenths of a pound of grain daily, while one being used during the breeding season receives 3.3 pounds daily. Barley is the grain of choice in the Southern Ukraine. As one moves east, it is found that milo grains are, in many cases, used to replace some or all of the barley.

Chickens

The study group visited the Ukraine Poultry Research Institute in the Kharkov area and was able to get some information on the feeding of laying hens. There were some major differences between their feeding methods and those used in the United States. The Soviets always feed wet mash; water and liquid milk are used as wetting agents. The mash is usually composed of ground corn, ground wheat, wheat bran, ground oats, soybean meal, meat, fish or whale meal, yeast, sodium chloride, calcium carbonate, and a fermentation product containing an antibiotic. In addition, they believe that green feed is essential. During the summer, waste vegetables such as onion tops, potato tops, and other green feeds are chopped and fed. In the winter a special silage for chickens replaces the green feed. The special silage is composed of 60 percent of whole ear corn, which is finely chopped while in the milk stage, and 40 percent of finely ground carrots. This silage contains 65 to 70 percent of water, 40 micrograms of carotene per gram, and has a pH of 4.2. As it contains 0.35 feed unit per kilogram, the dilution effect upon a concentrate ration is not as great as one might expect.

They are using methods established in the United States in their broiler production practices. It was emphasized that their rations are similar to those developed and used in the United States. They seem to be convinced, however, that wet mash and green feeds are necessary to maintain high levels of feed consumption in all classes of chickens. Biomycin (chlortetracycline) is the antibiotic of choice in the feeding of chickens, turkeys, and ducks.

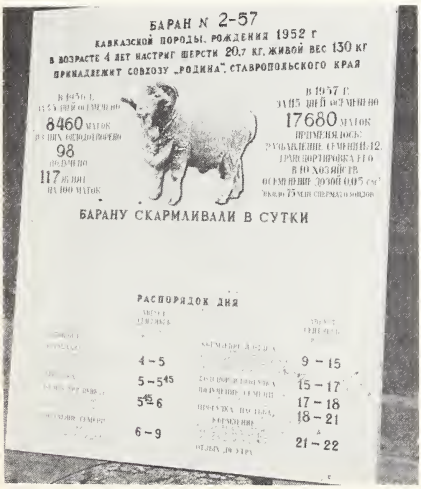
Artificial Insemination

The study group visited a number of artificial breeding centers in various parts of the Soviet Union. They also observed research on this subject at several research institutes. The use of artificial insemination as a tool for herd improvement has increased rapidly during the past few years. Vice Minister Checkmenev stated that 5,800,000 cows were bred by this method in 1958, and he estimated that 8,000,000 cows would be bred during 1959. This figure included 1,000,000 cows owned privately by collective farmers. The present rapid increase in use of artificial breeding of cattle is following the pattern established earlier with sheep. Over 30,000,000 ewes were bred artificially in the Soviet Union in 1958 and they are planning on inseminating 40,000,000 in 1960. Similarly, 30,000 swine were inseminated in 1958. Methods are under study and development for use with other species.

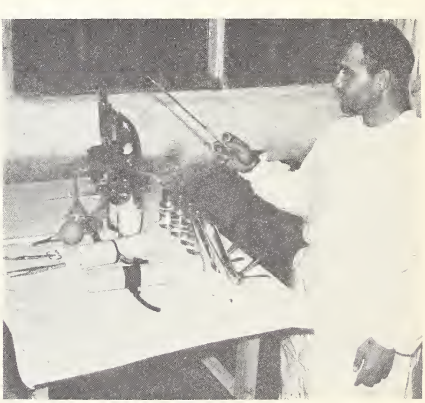
In most respects the artificial breeding program of the Soviet Union is similar to that of other countries. Stud farms are usually operated as part of a state farm under supervision of the Ministry of Agriculture. However, the artificial breeding center is usually budgeted separately from other farm operations. A typical center near Kiev had 50 bulls and 15 rams. In 1958 these sires provided semen for services to 52,330 cows in 200 cooperating collective and state farms in the area. Semen is priced on a per cc. basis that varies according to the quality of the bulls and rams and the volume of business for each cooperating farm. The per cow cost of breeding in the Soviet Union was equal to or higher than similar costs in the United States.

Techniques employed in artificial insemination were similar to ours with a few exceptions. Fresh semen diluted with yolk citrate at rates of 1:20 to 1:40 is generally used throughout the country. The usual antibiotics are added and storage temperatures are similar to those used in most countries. All types of transportation from bicycles to aircraft are utilized. Shipments are made from the stud farms every 3 days.

Each collective or state farm employs a veterinarian and one or more lay technicians



Poster showing performance of outstanding ram—All-Union Exhibition, Moscow.



Inseminator and equipment used for artificial insemination of sheep.

specially trained in artificial insemination techniques. Cows are inseminated as soon as heat is discovered and are rebred 10 hours later if still in heat. The group was told that this universal practice of double breeding materially improved the conception rate. The large herds and availability of trained personnel make it feasible to employ this method. All inseminations are into the cervix and the speculum method is used. Most other countries utilize the rectal palpation technique of insemination. However, the group was told on several occasions that the Soviet technicians had found the speculum method superior for their purposes.

The present use of artificial breeding and emphasis given to fundamental research in this area indicate that this method of breeding will be important in the future improvement of livestock in the Soviet Union.

Physiological Research

General Impressions

The work in physiology of reproduction and endocrinology of domestic animals in Russia is generally not comparable to the research in these areas in the United States. At the Kharkov Institute, where the team physiologist had an opportunity to discuss his own research as an example of the kind that is representative of interests of United States workers, criticism was made that this work had no immediate applicability to practical problems and hence was sterile and was characterized as "dry scholasticism." The implication was that knowledge for knowledge's sake is not sufficient justification for doing research and that all research must be done in terms of ultimately providing useful information which can find application in the practice of agriculture or medicine. Although basic work is not frowned upon, it must be justified as eventually leading to practical application. The question, how one determines what kind of work may lead to useful results and what kind may not, brought the answer that this can be done by the "cooperative" which decides whether the research proposed is likely to lead to useful results or to fill a gap in the knowledge which will lead to eventual practical application.

In general, the research in physiology is centered around the role of the thyroid gland in wool production, egg or milk production, and rate of gain. The statement was made that much more work is needed in this area. The degree of acquaintanceship with research done by western scientists varies from one laboratory to another. In some laboratories, work done in the United States and in Europe previously was presented as being original with these laboratories.

Research in Artificial Insemination and Related Subjects

The following random observations on the artificial insemination practice may be of interest. On one collective farm, 13 fine wool rams of high individual wool productivity were used maximally for 115 days and semen obtained from them was used to inseminate 69,955 ewes. The best ram, which has a statue erected to him, produced enough semen in 115 days to inseminate 17,860 ewes and is credited with 18,414 lambs. A standard procedure is to use two inseminations per heat and a conception rate of 98 percent is claimed. These 13 males were ejaculated three times daily and sometimes two ejaculates were obtained within a few minutes of each other although 1 hour usually was allowed between ejaculations. In all cases artificial vaginas were used. In 4 years, ram No. 257 produced 37,000 lambs; in 1 year this ram produced two to three ejaculates daily within 3 hours of each other and kept this production up for 115 days. While these claims may seem improbable, they may be true if one considers the extreme individual care that is given each ram. Each ram was fed separately a ration which contained whole eggs, cream, milk, selected oats, and other high energy feeds. The rams were housed in individual stalls with special floors which were wetted down in the summer in order to reduce the temperature of the rams.

One of the main problems in artificial insemination in sheep is that, because of the management practices in the Steppe country of Russia, the artificial insemination facility must follow the flocks on the range. The semen is obtained on the range and used for artificial insemination immediately either undiluted or at a dilution of 1:1 to 1:3. An insemination dose of 0.02 to 0.1 cc. containing about 75 million sperm was introduced into the cervix. Special collapsible and rapidly assemblable enclosures are used for checking the ewes for heat with an approved teaser ram and for obtaining ejaculates from rams. Semen was sometimes transported to as many as 10 farms within a distance up to 24 miles.

Great interest is shown in the possibility of maintaining semen at room temperature. The Illinois Variable Temperature diluter has been tried in several laboratories in Russia and was found to be impractical under the conditions under which it was tried. In the laboratory of Milovanov at the Institute of Animal Husbandry near Moscow, experiments are underway to substitute nitrogen for carbon dioxide in semen preservation, and a new diluter which is distinctly different from the ones commonly used is being tried. This new diluter is pro-

duced in powder form and contains sugars, glycine, glucose, phosphoric acid, egg yolk, antibiotic, streptomycin, sulphanilamide, and mucinase. This mixture is lyophilized and can be reconstituted with water and used as a semen extender in the field. A claim was made that this powdered extender increased fertility up to 12 percent in the experiments in which it had been used and that this technique shows great promise in preserving semen at room temperature.

Frozen semen is used at 20 different studs only in cows and conception rates of 50 to 65 percent with frozen semen are claimed. The conception rate after the freezing of ram semen is only 30 to 35 percent, and for this reason it is not being used practically. Eighty percent of all the sheep are inseminated with fresh semen, and only 20 percent with semen stored at 0° C. up to 3 days.

Methods of semen evaluation were outlined at one center. Sperm motility was assessed under the microscope at 38° C. Sperm concentration was determined by hemacytometer counts. The motility impedence method of Rothschild was widely used. Resistance to a sodium chloride solution was considered as also was survival time at 0° C. Vital staining was used only rarely. About 5 percent of rams were being discarded because of low-quality semen.

At the Kharkov Agricultural Institute, one of the most up-to-date institutions visited, much work on freezing of semen is being done. Incidentally, this was the first place in the world at which frozen semen was used for artificial insemination and here the first calves and lambs were obtained from previously frozen semen. The primary interest is in discovering why frozen ram semen shows a very low viability after thawing. Obviously, ram semen is much more sensitive to freezing than is bull semen and for this reason they are investigating the so-called "step-wise" freezing technique of ram semen in an attempt to overcome the difficulty. This involves initial lowering of the temperature very slowly to 0° C. In the second step the semen is frozen to —15° C. at a rate of ½° per minute and from —15° to —50° at the rate of 2° per minute. By this time the spermatozoa have reached complete immobilization. The final step lowers the temperature to —50°.

The yolk citrate, glucose, and glycerine are added to the semen in the second stage of the freezing process and not before. It is claimed that this method results in the extremely high survival rate of 60 to 70 percent of the semen as compared to a survival rate of only 30 to 40 percent under the rapid freezing, one-step method previously used. It is also felt that the addition of glycerine is detrimental to the survival of sperm and considerable work is being done in an attempt to find a substitute for glycerine.

At the same station a machine is being used to dry sperm under very high vacuum at temperatures of —70° to —80° C. The claim is made that such dry sperm show relatively good motility after the addition of water and after thawing. Such frozen-dried sperm has produced several litters of rabbits of unspecified size. This is particularly interesting in view of the recent success reported from the University of Maryland and the National Institutes of Health in using frozen-dried sperm in the artificial insemination of a cow.

Considerable amount of work is also being done on the storability of boar semen. Uniformly poor results have been obtained by all workers who attempted to store boar semen for more than 24 hours prior to insemination. The claim is made that centrifugation and redilution of the ejaculate makes it storable for extended periods of time, and a 60 to 70 percent fertility rate is said to be obtained from centrifuged semen stored 4 to 6 days. No information was made available on the degree of centrifugation.

Embryonal extracts obtained from dead chicken embryos are said to increase the viability of sperm cells when kept at room temperature of 60° to 70° C. and extend the viability of semen for as long as 3 to 4 days. Similar results are obtained from extracts of liver and spleen, but it seems that these organs must be obtained from dead chick embryos rather than living ones. The same group of workers has shown that the active principle in the yolk citrate diluter is not the yolk. They were able to remove the yolk globules by ultracentrifugation and to show that sperm survive in a supernatant fluid under experimental conditions much better than they do in a diluter containing the yolk granules.

Some of the best work on physiology of reproduction observed was being done in the laboratory of the husband and wife team of Lopyrin, Agricultural Academy, Stavropol. They are working on problems of sperm physiology and are doing much work on the reasons why ram semen cannot be frozen as well as the semen of bulls. They are working along lines mentioned earlier in this report such as centrifugation of ram semen and substitution of diluents in different proportions obtained from the accessory fluids. They claim considerable success, although the repeatability of their experiments was admitted to be low.

They also have an interesting series of experiments involving wide species crosses in which it was found that crosses made between wild mountain sheep and domestic sheep are successful in one direction but completely unsuccessful in the opposite direction. The reason for this peculiar result, which has been noted in other wide crosses, is being investigated but no definite results have been obtained. One of the reasons for their interest in this particular type of work lies in the belief that the wild relatives of domesticated species may have valuable genes to contribute to the general population which are not present in the domesticated strains.

At the same station considerable work is being done on rumen biology, with particular emphasis on the role of the nervous system in the innervation of the different portions of the rumen in relation to digestion. The question is being investigated whether the functions performed by the different compartments of the rumen can be modified by altering the nerve impulses that control the various portions of the digestive tract. Significant modifications in the ability of the rumen to handle various types of feed are said to follow alterations in the innervation of the rumen.

Workers in artificial insemination and in physiology of reproduction in general in the Soviet Union have at their disposal a large number of collective farms on which the experimental work can be conducted on large numbers of animals. Thus, for instance, the Animal Husbandry Experiment Station at Teresino has a bull stud of 50 bulls and 15 rams. The semen obtained from these males each year is used to artificially inseminate 52,333 head of cattle on 200 collective farms, all of these animals being available for experimental work. During the first 9 months of this year, 47,000 head of cattle have been inseminated, and it is planned to inseminate 60,000 head by the end of 1959. Artificial insemination used on this large scale provides much information on effectiveness of diluters, etc., and is credited with much of the immediate effect on animal improvement that is claimed in Russia.

The collective farm, to qualify for purchases of semen from the bull stud, must comply with regulations laid down by the Central Planning Committee of the Republic. These regulations include directives regarding proper feeding and management practices and the collective farms must also agree to follow directives regarding improvement in the genetic potential of their herds. Planning of this type is done for the whole geographic area which is climatically and agriculturally homogeneous. In some instances, a whole republic can come under a single plan. Methods in the genetic selection of animals change in accordance with the regional demands and may differ within the same region, depending on how many breeds of cattle or sheep are represented within the Republic. The number of breeds within a Republic or a region depends on the number of climatic conditions in that Republic.

Pavlov Institute at Leningrad and Koltushi

Part of the Institute is located at Leningrad with 27 departments and three clinics. At Koltushi there are 8 laboratories. A separate research and administrative staff in each location is in charge of the research work, although many members have joint appointments between these two locations. The most important problems under investigation are:

1. *Types of higher nerve activity in relation to the developmental age of animals.* The theory is being investigated that nervous activity of animals changes with increasing age and that the nervous system ages just as do other systems. It is postulated that the degree and kind of control that the nervous system exerts over the other organ systems is significantly modified by age.

2. *Inheritance of acquired characters.* Experiments are conducted on mice which, during several generations, undergo training in which they are taught complex conditioned reflexes. A comparison is made between the rates at which the offspring of trained and untrained but otherwise homogeneous strains, are able to learn these complex conditioned reflexes. At the present time (1959) two experiments showed that offspring of trained parents solved problems faster than did offspring of untrained parents. One experiment gave negative results. Conclusions cannot be drawn yet and work on this problem is being continued.

3. *Role of the nervous system in disease resistance.* Of interest are the results which suggest that the nervous system may play a role in resistance to disease and specifically to tumor formation of rats and mice. In this work populations of mice were divided into groups according to their individual ability to learn and according to their inherent tendency to show different degrees of spontaneous activity. Thus, groups of mice were obtained which learned slowly and others which learned fast, groups which showed a great amount of spontaneous activity and groups which showed little spontaneous activity. These different populations were

observed over long periods for spontaneous tumor formation. If no spontaneous tumors arose, they were induced by chemical means. The fast learning mice also turned out to be the ones with the greater spontaneous activity. These two groups were combined and were called the "nervous strain." In contrast, the slow learners which also showed lower degree of spontaneous activity, were called the "non-nervous, or phlegmatic group."

The "nervous" strain (mostly strain C57) gave a lower rate (39 percent) of spontaneous tumor formation, whereas the mice of strain A, which were predominantly nonnervous, had a tumor formation rate of 73 percent. The rate of progress of disease was also different in the two lines. With either spontaneous or induced tumors animals classified as "nervous" died faster after they became sick, while mice in the "nonnervous" strain died much slower and metastases occurred in them while no metastases were found in the nervous strain. On the basis of this and similar work the question is being asked whether the nervous system plays a role in determining degrees of resistance to disease in general and cancer in particular. If these results are confirmed (they appear to be repeatable at the Pavlov Institute), the question arises what organ system is actually most responsible for the results observed. While the assumption is being made that "slow learning" vs. "fast learning" and "high activity" vs. "low activity," are caused by differences in responsiveness of the nervous system, it is equally conceivable (to us) that they reflect differences in metabolic rate, with all the differences in rates of hormonal function that this implies. This possibility is not denied at the Pavlov Institute but it is firmly pointed out that the nervous system is also very definitely implicated.

In other experiments a homogeneous strain of both mice and rats was divided into two groups. One group was made neurotic by application of stress, usually electric shocks. The neurotic animals were found to be much more susceptible to induced tumors. In general, the conclusion is reached that not enough attention has been paid to the nervous system, as an important agent in governing the physiological system such as the visceral system as a whole.

4. *Analysis of the cortico-visceral system.* Experiments are also being conducted on the cortico-visceral physiological system. It was found that conditioned reflexes of visceral origin can be set up. For instance, signals originating in the lining of the uterus, or the lining of the stomach or intestines, can be localized in specific areas of the cerebral cortex. By using the method of extirpating specific areas of the cerebral cortex, it was found that the signals originating in the various areas mentioned have their separate receptor centers in the cerebral cortex. The experimental work involves the chronic irritation of specific visceral end organs, and finding, by the process of elimination, which cortical areas are responsible for the control of these end organs. Experiments have progressed to the point where it is now possible to reverse the procedure and, by irritating specific cortical regions, characteristic responses of the visceral end organs can be induced. In one example cited, it was possible by stimulating specific cortical areas, to induce milk secretion in a bitch which had not yet given birth to pups. Similarly, it was possible to inhibit milk flow in a bitch which had given birth to pups even though the nipples were stimulated. In other experiments secretion of digestive juices was caused by irritating specific cortical areas.

These experiments are used as evidence for the importance of the nervous system which, under the conditions described, may completely bypass the endocrine system or, more correctly, it may be regarded as being a coordinating center for the activity of the endocrine system. Thus, it appears that the endocrine system is not autonomous but is under the partial control of the central nervous system. By extension it would also appear that the flow of digestive juices and the digestive process itself are coordinated by the central nervous system. The fact that lactation may be induced by hormonal means is not denied, but the fact that the central nervous system is the coordinating or governing agent of lactation, is being prominently put forward as the logical explanation.

Further experiments along this line have been conducted on goats. It is generally known that in lactating females milk letdown can be induced by the injection of oxytocin into the blood stream. It is assumed by most endocrinologists that this is an autonomous reaction and that normally the suckling impulse is transmitted neurally from the udder to the hypothalamus and from there to the posterior pituitary gland causing the release of endogenous oxytocin which acts on the endothelial system of the udder causing it to contract and squeeze out the milk from the milk secreting cells. Experiments conducted in the United States and in

England have shown that denervation of the mammary gland causes the signal from the mammary gland to the hypothalamus to be interrupted, thus preventing the release of oxytocin. However, experiments conducted in Russia show that in animals in which the udder has been denervated injection of oxytocin does not induce release of milk. The argument is advanced that a very definite two-way participation of the nervous system is involved. Conversely, suckling of a denervated udder causes milk letdown.

5. *General participation of nervous system in physiological events.* In further experiments the theory that the nervous system participates in all physiological events is tested in the following way. Dairy cows are placed in special chambers in which they can be isolated from external stimuli. A constant stimulus is applied to each animal and the excitation or inhibition which is induced by this constant stimulus is recorded by means of a variety of recording instruments attached to the animal. For example, rise or fall in the respiratory rate, temperature, blood pressure, changes in heart beat, and similar phenomena are all recorded following the stimulus given. Individual variation in the intensity of responses to such stimuli is significant; some cows respond not at all or only mildly, others violently. On the basis of this variety of responses, the animals can be divided into three categories which, in rough translation, can be called strongly equilibrated animals, equilibrated, inert or weakly equilibrated animals. In 54 animals which were classified in this manner, the majority were found to be well equilibrated (groups 1 or 2). The implication is that in them the nervous system is stable and not easily upset by exogenous stimuli or irritants. Thus, in these groups the shift in reflexes, e.g., respiratory rate, heart rate, etc., were minor or absent even after repeated trials. When the milk yields of these animals were compared the following results were obtained:

Group No.	*Annual yield (360 days) (pounds)*	*Johansson's index of persistency (percent)*
1	13,625	78.3
2	12,135	80.1
3	10,820	73.1
4	10,360	66.4

Here again the implication is made that the stability or instability of the nervous system is reflected in physiological activity. The emphasis is placed on the nervous system as the causative agent with the other systems playing a secondary and subservient role. Suggestions to reverse this order of emphasis are firmly rejected. Much work along these lines is being conducted on laboratory animals and humans.

Summary

The U.S.S.R. is expending great efforts to increase livestock farming and the production of animal foods. Recent government decrees and statements include directives to significantly increase the acreage of land devoted to feed crop production, especially corn for silage, and the almost passionate slogan "beat America in milk and meat production." The idea of surpassing the U.S. in milk and meat production appears to have been strongly impressed on all farm people, and this slogan actually serves to spur to greater efforts the people engaged in livestock production.

Milk, meat, egg, and wool production have significantly increased since the end of World War II. This has been the result not only of greatly increased numbers of animals in the various classes but also of increased production per animal unit. Livestock numbers, in the western half of the U.S.S.R. especially, were greatly reduced during World War II and the immediate past has been one of repopulation. Under these conditions, selection for superior merit in performance has played a secondary role but is increasing in importance as time passes. Selection is based on items of performance such as milk, meat, wool, and egg yield per animal and per unit of size, rate of gain, weight for age, etc., rather than on points of breed type, conformation, and color.

Cattle are almost exclusively the dual-purpose type in that they are bred and selected mainly for milk, but the same breeds provide the meat supply as well. Available statistics suggest that milk yield per cow has increased rather steadily since 1940 but the rate of increase has been only two-thirds that of the United States from 1940–58. Universal emphasis in breeding and selection programs is on increasing the butterfat content of milk. Much less consideration is given to beef meat, which supply comes from the dairy herds. The study group heard a great deal about plans to specialize in dairy and beef production. The Vice Minister of Agriculture, Mr. E. M. Checkmenev, made special point of this in discussions with the team. It was apparent that this conclusion was arrived at in part at least following the visit of the Russian Animal Husbandry Study Group (of which he was chairman) to the United States in 1958. As a further indication of this policy, a Russian purchase mission visited the United States early in 1960 to obtain several hundred head of breeding animals of several of the beef breeds for use in establishing improved beef strains at home. How far they can and should go in this direction without sacrificing total milk production will depend in no small measure on their ability to develop dependable and adequate feed supplies.

Hog production is an important enterprise on most farms. Pork is an important and popular meat and the most available meat for the consumer. Many of the numerous breeds of hogs are based on importations of the Large White and Berkshire. The animals are large, generally marketed at older ages and many are of the lard-type as judged by western standards. There was considerable indication that emphasis is turning to a meat-type hog. This is further indicated by the purchasing mission to the United States for the purpose of obtaining several hundred breeding animals of meat-type breeds for use in the U.S.S.R. Rations fed emphasize wheat byproducts, skim milk, cooked potatoes, pumpkins, etc., garbage, chopped forage, and pasture, and limited grain. Feeding hogs with mash feeds is popular.

The sheep industry is well developed with a population of about 130 million. Efforts are directed toward further increasing sheep numbers, particularly those producing fine wool. Many fine-wool breeds of Merino, Rambouillet, and Precose breeding have been developed. Some semifine wool breeds have resulted from crossing with British mutton breeds. Both semi-fine and coarse wool types include fat-rump and fat-tail breeds, which are valued for fat as well as mutton production. A number of breeds are kept for skins and fur pelts. The sheep are large, produce heavy fleeces of good quality, and appear to be well cared for. Much more emphasis is placed on wool than on meat production, the meat coming mainly from older animals. Lamb meat was not much in evidence.

Obviously the Soviets are attempting to increase wool production through breeding as well as by increasing numbers. Intense selection is practiced for wool production and other performance traits. Highly selected rams are given additional feed and care and are widely

used in artificial insemination, being mated usually to between 500 and 1,000 ewes per year. Prices of fine-wool rams vary with weight of clean wool produced. All wool is sold on a clean basis and prices of both wool and mutton are higher than in the United States.

Sheep are herded in summer, and sometimes year around, in small bands on pasture land which appeared to be overgrazed. They are often supplemented with harvested forages and grain. Winter feeding involves hay, silage, straw and grain. Lambing takes place in late winter, generally in barns or sheds. Shearing is done on tables with machines in May and June. Goats are generally privately owned and are used for milk, meat, mohair and down. Fur farms are similar to those in the United States and foxes, mink, sable and nutria are raised. Rabbits are raised for meat but were observed only in markets.

Poultry, including chickens, ducks, and geese, are raised in large numbers (and to a lesser extent turkeys also), and their products are popular foods. Ducks and geese are much more numerous than in the United States. There was much talk, but little evidence, of a broiler industry as we know it in the United States. Indications are that leaders in the poultry industry are beginning to develop broiler strains of chickens. Shipments of eggs of broiler strains from the United States have been numerous in the last few years. A U.S.S.R. purchasing mission visited the United States in May 1960 for the purpose of obtaining hatching eggs from superior breeding stocks for use in developing broiler breeds. The success in this venture will no doubt depend in no small measure on how well they can also develop a dependable, adequate, highly specialized feed supply for this purpose.

Livestock on the farms visited by the study group appeared to be well fed and cared for. Observations suggest that livestock on some other farms not visited and cattle observed in private holdings were less well fed. An abundant supply of labor, mostly women, is used in caring for the animals. The labor appeared to be inefficiently used. The Soviets seemed to be making progress in the mechanization of livestock operations but they have a long way to go to meet western standards. Such mechanization as was observed did not appear to replace much labor.

In the more arid sections of the Ukraine, where livestock were observed on the range, ovregrazing was extreme. The study group was told about range improvement practices at institutes but observed none on range land. Only in Latvia, in the humid belt of the Northwest, did the group see sown pastures as an important part of the agricultural program. Here, although appearing to be well managed and highly productive, the older pastures were quite badly infested with an annual weed. Green feed including corn is grown, harvested, and fed to cattle in barns or drylots in summer in the arid regions and corn silage is a major forage in winter. The rate of grain feeding for milk cows is at least as heavy as that used in the United States. Sheep on range receive much more supplemental feed than our western range sheep. Feeding of livestock according to established standards appears to be rather universally practiced.

Artificial insemination is well established in the sheep industry where over half the ewes are inseminated annually. Over 5 million cows were inseminated in 1958 and plans are to increase this to 10 million by 1961. Some use of artificial insemination is made with hogs and chickens but this, as in the United States, is in the beginning stages. Most of the inseminations are with fresh semen. Conception rates seem to be about the same as they are in the United States. Frozen semen has not gained the popular use as yet that it has in the United States.

Major efforts are being made to train large numbers of young people for careers in agriculture and animal husbandry. Numerous agricultural academies and lesser agricultural schools are available throughout the U.S.S.R. Students matriculating in the agricultural academies appear to be older than those in the United States, receive at least as much training in basic sciences, but are required to do more on-the-farm apprenticeship work to obtain a degree.

A large, coordinated research program is developing to support the expanding livestock industry. Numerous All-Union and Republic research academies and experimental stations are engaged in a broad area of research related to animal husbandry, including genetics and breeding, physiology, nutrition, and feeding and management. Considerable basic as well as applied research is in progress.

In the area of genetic improvement great emphasis is placed on the development of new breeds especially adapted to particular regions. It appears relatively easy to develop a new breed. Crossbreeding for this purpose is much in vogue. The study group was not greatly impressed with the breeding research observed. The Soviet animal breeder appears to be dominated by Lysenko's theories, although intense selection is generally practiced, especially with sheep. Not much evidence was observed of carefully conceived breeding plans or control populations in the research reviewed.

Research on artificial insemination is in progress in a number of institutions. Some work was in progress on semen preservation by freezing and other methods, but for the most part the work concerned itself with developments and improvements for handling fresh semen.

The research on physiology observed in several laboratories dealt with neuro-physiology and hormonal physiology relating to growth, reproduction, and lactation. The group was especially impressed with some of the work at the Pavlov Institute of Physiology at Koltushi.

The group was disappointed in what they saw of the research in animal nutrition and feeding. Some interesting work in rumen metabolism was observed at a number of institutes. Energy metabolism research was in progress at a few stations. One problem that was receiving considerable attention was protein and amino acid requirements. This interest no doubt stems from the existence of limited supplies of high protein feedstuffs. Some work on silage preservation was observed but not much on feeding trial evaluations of feeds and rations that make up an important part of the research effort in the United States. The use of feed additives and antibiotics has not attained the importance in livestock feeding that it has in the United States.

Several laboratories visited dealt with research on wool. Wool research was extensive and was closely related to breeding research for the purpose of evaluating wool yield and quality.

The research facilities appeared to be adequate for the job at hand. A number of laboratories were engaged in or were planning radioisotope research. Laboratories often were small, crowded, and not very modern; and the equipment did not measure up to what we are accustomed to in the United States. At the same time, the Soviets are embarked on a research program that will be of considerable assistance to an expanding livestock industry in the U.S.S.R.

Appendix

Itinerary of the U.S. Animal Husbandry Study Group

Moscow

August 6
1. All-Union Ministry of Agriculture
   - Mr. E. M. Checkmenev, Vice Minister
   - Mr. Esaulov, Chief, Animal Husbandry Inspection
   - Mr. A. F. Kharchenko, Head, Division of International Cooperation
   - Mr. Fedosov, Assistant, Division of International Cooperation

August 7
1. All-Union Permanent Exhibition
   - Animal Husbandry Section—Mr. A. I. Logachov, Chief
   - Cattle Department—Mrs. Gaorilov, Specialist
   - Veterinary Department—Mr. V. A. Sergeyer; Mr. Kmet and Mdm. Nemchenko, Specialists
   - Poultry Department—Mr. Gowhova, Specialist
   - Sheep Department
   - Fur Animal Department

August 8
1. All-Union Academy of Agricultural Science—Timiryazev
   - General—Mr. Gregory M. Loza, Director
   - Soils Museum—Mr. V. P. Buskinsky, Head
   - College Dairy Herd—Mr. E. F. Liskum, Head
   - Horse Museum—Mr. V. O. Vitt, Head
   - Animal Husbandry Department—E. F. Liskum, Head

August 9
1. University of Moscow
2. Kremlin and Red Square
3. American Exhibition

August 10
1. Animal Husbandry Research Institute
   - Mr. N. K. Burlakov, Director
   - Wool Laboratory—Mr. Karkenherman, Head
   - Artificial Insemination Laboratory—Mr. Kuznetov, Head
   - Feeding and Fodder Laboratory—Mr. M. V. Thorne, Head
2. Animal Husbandry Research Institute Experimental Station, Podolsk

August 11
1. Academy of Genetics—Mr. T. D. Lysenko, Director
2. Academy of Genetics—Experimental Base of Vaskmil—Gorky—Mr. T. D. Lysenko, Director
3. Lenin Collective Farm—Gorky—Mr. Booionok, Chairman

Leningrad

August 12
1. Ministry of Agriculture—Leningrad Department
   - Mr. Ivan V. Dolgoborodov, Chief Zootechnician
   - Mr. E. G. Plarizing, Senior Zootechnician
2. Leningrad Academy of Science—Institute of Zoology
   - Mr. B. E. Dikhovsky, Deputy Director
   - Mr. A. S. Momchedsky, Head, Parasitology Department
   - Mr. A. I. Ivanov, Head, Vertebrate Department
   - Mr. K. A. Briev, Specialist, Medical Enzymology
   - Mr. V. N. Nicholskia, Secretary of Institute
   - Miss Inna Afonicheva—Interpreter
3. Peter the Great—Summer Palace

August 13
1. Leningrad First Dairy Combine
   - Mr. Stepan Danilovich Sustov, Director
   - Mr. Anton P. Shlyakhtech, Deputy Director
   - Mr. Aleksei Fyodorevich Surkov, Chief Engineer
2. Red Partisan Collective Farm—Mr. M. T. Petranin, Chairman

August 14
1. Pavlov Institute of Physiology—Koltushi
   - Laboratory of Physiology of Lower Organized Animals—Mr. M. E. Lobashev
   - Laboratory of Ecological Physiology—Mr. A. D. Slonim
   - Laboratory of Bees, Fish and Birds—Mr. Tahakna, Specialist
   - Laboratory for Study of Physiology of Farm Animals—Mr. I. A. Boryshnikov, Head; Mrs. E. P. Konorina, Specialist
   - Laboratory of Experimental Genetics—Mr. Bodonette, Head
2. Leningrad Agricultural Research Institute
   - Mr. V. A. Bryzgalov, Director
   - All-Union Institute of Plant Breeding—Mr. I. A. Sisow, Director
   - Division of Wheat—Mr. M. M. Jacobziner, In Charge
   - Division of Seeds—Mr. M. A. Shebalina, In Charge
3. Hermitage and Leningrad Museum

August 15
1. Pushkin Agricultural Academy and Laboratory for Animal Multiplication
   - Mr. V. A. Bryzgalov, Director
   - Animal Husbandry Department—Mr. M. M. Lebedev, Head
   - Physiology Department—Mr. Eliseev, Head
   - Horticulture Department — Mr. Zhoochkov, Plant Breeder
   - Field Crops Department—Mr. I. V. Larkin
2. Summer Palace and Art Gallery

Riga

August 16
1. Latvian Ministry of Agriculture—Mr. Michalovia, Minister
   Division of Animal Husbandry—Esera Ilga, Head; Godmone Ingrida, Specialist; Ligija Cjursa, Teacher; Olga Paturšky, Interpreter
2. Institute of Animal Husbandry and Veterinary Medicine
   Cattle Breeding Department
   Field Crops—Viktors Terouds, Pasture Specialist
   Chemical Laboratory
   Microbiology Laboratory
   Wool Laboratory
   Experimental State Farm—Cattle and Swine Units
3. Red October Collective Farm—Rouma
4. Livinis Collective Farm—Cesis

August 17
1. Latvian Ministry of Agriculture—Mr. Nicholvia, Minister, and staff

Kiev

August 18
1. Ukrainian Ministry of Agriculture
   Mr. Zorin, Vice Minister in Charge, Animal Husbandry
2. Ukrainian Permanent Exhibition—Animal Husbandry Division
   Mr. Dubrovin, Director; Mr. Mozhilezsky, Technician

August 19
1. Animal Husbandry Research Station—Teresino
   Mr. V. M. Zubonov, Director; Mr. P. I. Omelchinko, Deputy Director
2. Animal Husbandry Research Station
   Cattle Breeding—Mr. C. I. Klassin
   Sheep Breeding—Mr. Tirlovay
   Nutrition—Mr. V. I. Tanserov
   Swine Breeding—Mr. P. I. Omelchinko
   Artificial Insemination—Mr. I. V. Smirnov

Kharkov

August 20
1. Bolsheviki Collective Farm
   Mr. Nerovny, Chairman; Mr. Sukharev, Zootechnician; Mr. Malnick, Agronomist

August 21
1. Animal Husbandry Research Institute of Kharkov
   Mr. F. F. Aisner, Deputy Director
   Physiology Department—Mr. V. A. Kaplan, Head
   Nutrition Department—Mr. N. A. Starovierov, Head
   Veterinary Department—Mr. Brailovsky
   Biochemical Department—Mr. Zacharchenko, Head and Mr. Fesenko
   Feed Production Department—Mr. Taranienko, Head
   Horse Department—Mr. A. A. Walkov
   Cattle Department—Mr. F. F. Aisner, Head; Mr. Yatsenko; Mr. Gertzen
   Swine Department—Mr. Meded, Head; Mr. Belegub
   Sheep Department—Mr. Boroshenko; Mr. Ivanyenko
   Artificial Insemination Laboratory—Mr. Korenko, Head; and Mdm. Volosevich and Mdm. Ostaskko, Technicians
   Wool Laboratory
   Rabbit Department—Mr. Kaliov
2. Animal Husbandry Research Institute—State Pedigree Farm
   Mr. F. F. Aisner, Deputy Director

August 22
1. Ukrainian Research Institute for Poultry—Borki
   Mr. N. V. Dokhnovsky, Director; Mr. V. I. Popov, Vice Director
   Physiology Laboratory—Mr. V. A. Vladlen, Head; V. V. Haskin
   Incubation—Mr. A. U. Bichovetz
   Nutrition Laboratory—Mr. A. D. Asechuk
   Pond Nutrition—Mr. But
   Breeding Laboratory—Mr. Dublovsky
   Biochemistry Laboratory—Mr. V. V. Khaskin, Head
   Mechanization Laboratory—Mr. E. C. Kagulis

Askaniya Nova

August 23
1. Askaniya Nova Research Institute
   Mr. M. T. Balaskov, Director
   Botanical Gardens

August 24
1. Askaniya Nova Research Institute
   Mr. M. T. Balaskov, Director
   Livestock Department—Mr. Grebin, Vice Director; Mr. Makeev, and Mrs. Duinaia, Cattle Specialists
   Wool Laboratory—Mrs. Krpova, Specialist
   Field Crops Department—Mr. S. P. Kaplonousky, Crop Specialist
   Mr. I. A. Stepanova, Taxonomist
   Experiment State Pedigree Farm—Mr. M. T. Balaskov and staff

August 25
1. Red Herdsman State Farm
   Mr. G. N. Egrov, Chairman; Mr. Tolmachov, Sheep Breeding Specialist
   Artificial Breeding Station
2. Stalin Collective Farm
   Mr. Cherniov, Chairman

Genichesk

August 26
1. Georgia Collective Farm
   Mr. Legunov, Chairman

August 27
Travel Genichesk to Semferopal (Crimea) by bus. Semferopal to Mineral Water by air. Mineral Water to Stavropol by car

Stavropol

August 28
1. Stavropol Department, Russian S.S.R.
   Mr. Krotov, Governor; Mr. E. P. Raunas, Vice Governor
2. Research Institute for Sheep and Goat Breeding
   Mr. I. D. Krainov, Director
   Breeding Section—Mr. N. T. Graysidin, Mr. M. I. Sannikov, Mr. L. D. Lebel, Mr. M. Y. and Mr. F. N. Yanchenko, Mr. S. I. Semenev, Mr. V. I. Sidortsev, Mr. M. A. Vasileva, Mr. Y. I. Galimski, Mr. A. K. Dudar, Mr. N. I. Basov and Mr. G. F. Lovrentev, Specialists
3. Stavropol Agricultural Institute
   Mr. A. A. Smirnov, Chairman
   Biological Science Department—Mr. Basil Skripchinskey, Head, Plant Physiologist

Plant Industry and Fodder Department—Mr. A. A. Kornilov, Head
Physiology Laboratory
Nutrition Laboratory
Livestock Department
4. Agricultural Research Institute for the Steppe Region—Mr. Gurkin, Director

Essentucki

August 29
1. Lenin Collective Farm
Mr. Sidorenko, Chairman

August 30—Travel Essentucki to Moscow by air

Moscow

August 31—Travel Moscow to Alma Ata by air

Alma Ata

September 1
1. Ministry of Agriculture Kazakhstan S.S.R.
2. Ray of the East Collective Farm—Mr. Didrovsky, Chairman
3. Michurin Collective Farm—Mr. Abdugrolov, Chairman
4. Academy of Agricultural Science Kazakhstan S.S.R.—Mr. G. Mukhomed,
President; Mr. Balmont, Vice President
Animal Husbandry Section—Mr. Elemenov, Secretary
Nutrition Section—Mr. A. K. Rosliskov, Head
Physiology Department
Sheep Breeding Section
Field Crops—Mr. Vladimar Matveer, Agronomist; Mr. G. M. Polumiskoc, Agronomist

Rubtsovsk

September 2
1. Barnail Department Russian S.S.R.
Mr. Gordeev, Vice Governor
Animal Husbandry—Director, Mr. Kudriotsev
2. Egarensk State Farm
Mr. Utkin, Chairman
3. Rubtsovsk State Farm Pedigree Factory
Mr. Bugnov, Chairman

September 3
1. Land of the Soviets Collective Farm
Mr. M. N. Vukhanko

Moscow

September 4
1. All-Union Academy of Agricultural Science—Timiryazev
Radio Isotope Laboratory—Mr. V. V. Richiniski, Director

September 5
1. All-Union Ministry of Agriculture — Vice Minister E. M. Checkmenev and staff

September 6
1. All-Union Horse Show

September 7
Left Soviet Union

Statistics on Livestock and Livestock Products

One of the first objectives of the animal husbandry study group was to obtain accurate statistics on the numbers of the different classes of livestock kept on the state and collective farms, and especially the numbers kept by the members of the collectives on their small, privately owned holdings. A second objective was to obtain information on the total yield and yield per animal unit of the various classes of livestock for the U.S.S.R., its republics, and by sectors of ownership. These objectives were only partially achieved.

TABLE 7.—*Livestock numbers, January 1 (million head)*[1]

Year	All cattle	Cows only	Pigs	Sheep and goats	Sheep only
1916 [2]	58.4	28.8	23.0	96.3	89.7
1928 [2]	66.8	33.2	27.7	114.6	104.2
1941	54.5	27.8	27.5	91.6	79.9
1946	47.6	22.9	10.6	70.0	58.5
1951	57.1	24.3	24.4	99.0	82.6
1953	56.6	24.3	28.5	109.9	94.3
1955	56.7	26.4	30.9	113.0	99.0
1957	61.4	29.0	40.8	119.8	108.2
1958	66.8	31.4	44.3	130.1	120.2

[1] From table on page 216, A Statistical Summary, U.S.S.R. in Figures. Central Statistical Department, Ministry of Agriculture, Moscow, 1958. Data on January 1, 1954 to 1957 concerning the number of cattle on state and collective farms are according to reports on agricultural population of the T.S.C.U. of investigations of the budgets of collective farmers, workers and employees.
[2] Within contemporary boundaries.

TABLE 8.—*Percentage increase in numbers of livestock on collective and state farms—July 1, 1958, compared to July 1, 1957* [1]

Kind of livestock	Percent [2]
All cattle	11
Cows	7
Pigs	11
Sheep and goats	7

[1] From table on page 30 of A Statistical Summary, U.S.S.R. In Figures, Central Statistical Department Ministry of Agriculture, Moscow, 1958.
[2] Increases also were reported for cows, pigs and sheep by unstated amounts on small holdings of individuals of collective farm workers.

The U.S. Agricultural Economists Study Group reported[1] the number of cattle, hogs, sheep and goats on January 1, 1958, as follows: Cattle 66.5 million, of which 31.4 million were cows; hogs, 44.3 million; sheep, 120.1 million; and goats, 9.4 million. Included in these were 29.5 million cattle, 15.3 million hogs and 34.5 million sheep owned by individuals on their small holdings.

This report also shows the following statis-

[1] See footnote 2, page 41.

TABLE 9.—*Number of pedigreed livestock on state and collective farms and the percentage of all cattle* [1]

Class	Feb. 1, 1932		Oct. 1, 1939		Feb. 1, 1954		Dec. 1, 1955	
	Number	Percent of total number	Number	Percent of total number	Number	Percent of total number	Number	Percent of total number
	Million		*Million*		*Million*		*Million*	
All cattle	1.3	10	4.5	29	16.0	63	19.2	74
Cows	0.6	11	1.4	25	6.4	65	8.3	73
Pigs	0.5	12	5.8	59	10.9	78	11.9	85
Sheep	3.3	21	24.1	66	55.1	78	59.9	87

[1] From table on page 226 of A Statistical Summary, U.S.S.R. In Figures. Central Statistical Department, Ministry of Agriculture, Moscow 1958.

tics on the production of animal products for 1956:

Livestock and poultry slaughtered, 23.6 billion pounds, live wt.
Meat production, including poultry, 14.6 billion pounds, dressed wt.
Beef and veal, 5.2 billion pounds, dressed wt.
Pork, carcass, including lard, 5.9 billion pounds, dressed wt.
Lamb, mutton and goat meat, 1.8 billion pounds, dressed wt.
Poultry meat, 1.7 billion pounds, dressed wt.
Egg production, 19.5 billion eggs
Wool production, 575.0 million pounds
Factory butter production, 1224.0 million pounds

A statistical yearbook[2], supplied by the Vice Minister of Agriculture to members of the livestock study group, is the source of the following statistical information. The numbers of the several classes of livestock, shown by years, are given in table 7. There has been a steady increase in numbers of all classes of livestock since 1951. The percentage increase in the numbers of livestock on collective and state farms July 1, 1958, as compared to July 1, 1957, is given in table 8. No statistics are given for privately owned livestock, but a statement is made that increases occurred in the numbers by private holdings.

Table 9 shows the increase in the numbers and the percentage of the total of pedigree livestock on collective and state farms for different years. The qualifications for admittance to the pedigreed class are not clearly defined. The herdbooks for the different classes of livestock apparently are the responsibility of the institutes in the various republics or departments. Usually the institute that developed a particular breed, or one that is working with the breed, has the responsibility for the pedigreed herdbooks. In addition to the work with the breed on the institute-owned state farms, other state and/or collective farms are used as pedigree increase farms.

The production of certain livestock products, per capita production, and the percentage of products coming from different production sec-

[2] A Statistical Summary, U.S.S.R. In Figures. Central Statistical Department, Ministry of Agriculture, Moscow, 1958.

TABLE 10.—*Production of meat, milk and butter in the U.S.S.R.*[1]

Item	1953	1957
	Million pounds	*Million pounds*
Total production:		
Meat and lard (slaughter weight).	12,808	16,207
Milk	80,245	120,450
All animal butter (oil)	1,093	1,654

[1] From table on page 219 of A Statistical Summary, U.S.S.R. In Figures. Central Statistical Department, Ministry of Agriculture, Moscow, 1958.

TABLE 11.—*Per capita production of meat, milk, and butter in U.S.S.R.*[1]

Item	1953	1957
	Pounds	*Pounds*
Meat and lard (slaughter weight)	68	79
Milk	420	590
Animal butter (oil)	5.7	8.1

[1] From table on page 220 of A Statistical Summary U.S.S.R. In Figures. Central Statistical Department, Ministry of Agriculture, Moscow, 1958.

TABLE 12.—*Contribution to production of livestock products by different farming sectors (1957)* [1] [2]

Sector	Meat and suet from all animals	Meat and suet from pigs [3]	Milk[4]	Wool[5]
	Percent	*Percent*	*Percent*	*Percent*
State farms	25	25	25	25
Collective farms	50	44	61	62
Private sectors of collective farms	22	21	17	12
Private sectors, other	3	3	2	
Total	100	100	100	100

[1] From table on page 221 of A Statistical Summary, U.S.S.R. In Figures, Central Statistical Department, Ministry of Agriculture, Moscow 1958.
[2] Collective and state farms in 1957 accounted for 75 percent of all meat products; 76 percent of all pig products; 81 percent of the milk; and 88 percent of the wool.
[3] In order for these percentages to agree with 76 percent for collective and state farms they would need to be increased by 7 points, also for the column to equal 100.
[4] The total of this column is 105 percent.
[5] In order for these percentages to agree with 88 percent for collective and state farms they would need to be increased by 1 point, also for the column to equal 100.

tors, taken from the report are given in tables 10, 11, and 12.

It is interesting to observe in table 12 that state farms in 1957 uniformly contributed 25 percent of the output for the country of total meat, milk, pork, and wool. This apparently was the result of good Soviet planning. These data show that 17 percent of the milk produced came from the private farms, whereas calculation from the USDA report (table 2) shows that 52.8 percent of the total milk production came from the private farms during that year.

Table 13 shows a comparison of the production of meat and milk for the years 1953 and 1957. The increase in total milk production shown for this period agrees with that in the USDA report. These data suggest a very large increase in both meat and milk production for a span of only 4 years and that progress is being made much faster on the collective and state farms than it is in the private sector.

TABLE 13.—*Percentage increase in production of livestock products, 1953–57* [1]

Product	Percent increase 1957 over 1953
Meat:	
Total, all sectors	138
Collective and State farms	178
Milk[2]:	
Total, all sectors	150
Collective and State farms	215

[1] From table on page 30 of A Statistical Summary, U.S.S.R. In Figures. Central Statistical Department, Ministry of Agriculture, Moscow, 1958.
[2] Average milk yield per cow on Soviet State farms at beginning of 1957—5940 pounds. Goal for 1960, 6820 lbs. 1957 total milk production reached 95% of production in U. S.

An additional indication of the progress of livestock production, as taken from the statistical report, is the increase in production of milk and wool per animal shown in table 14. These data concern only animals kept on what is apparently a selected group of state farms. This group of Soviet state farm cows is reported to have increased in average production 198 percent from 1934 to 1957 and 50 percent from 1940 to 1957. The average production in 1957 was 5,940 pounds.[3] Calculations from the USDA report, as depicted in figure 2, show that the average cow in the U.S.S.R. (all cows) increased productivity, on the average, 24.8 percent from 1940 to 1957. The average production per cow in the U.S. increased 36.9 percent during the same period. The data suggest that cows in Soviet state farm herds are making much faster increases in average production than cows on collective farms or those on private holdings, but none are increasing as fast as cows in the United States.

The long-term trend in wool yield, as indicated by this selected group of Soviet state farms, is steadily upward, but gains are less spectacular than in milk production. Additional statistics on sheep production, taken from this statistical bulletin, are given in tables 15 and 16.

Sheep numbers have more than quadrupled in the past 17 years and more than doubled in the past 4 years (table 15). The yield of wool per sheep has remained much the same during

[3] Table 14 states in footnote that average production of cows on all Soviet state farms is 5,091 pounds.

TABLE 14.—*Production of products per animal on Soviet state farms by years* [1]

Product	1934	1940	1945	1950	1957	Increase 1957 over 1934
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Percent*
Milk—cows	1,998	3,967	3,133	4,963	5,940	298
Wool clip—all sheep	5.7	6.4	5.3	5.9	7.0	123
Wool clip—fine wool sheep	7.5	9.9	6.6	8.6	10.3	138

[1] From table on page 192 of A Statistical Summary U.S.S.R. In Figures, Central Statistical Department, Ministry of Agriculture, Moscow 1958. This table carries a footnote to the effect that the average production of cows on all state farms was 5,091 pounds in 1957. On 662 state farms the average was 6,600 to 7,700 pounds; on 271 farms it was 7,700 to 8,800 pounds; and on 187 farms 8,800 pounds or over. The average yield per cow for all Soviet state farms in 1957 is given as 5,091 pounds.

this time at between 10 and 11.7 pounds per head. These data do not agree with the data on wool yield per sheep in table 13. It is interesting that the wool yields on the selected Soviet state farms (table 14) were not as great as wool yields on all collective and state farms reported in table 15.

The data in table 16 indicate that during the years 1932 to 1957 there has been a major decrease in the percentage of wool yield classed as coarse wool and an increase in the percentages classed as fine, semifine, and semicoarse wool. This is no doubt a reflection of the changes that have taken place in the demands for wool by the market.

An additional bit of statistics obtained from this report relates to the number of machines on collective and state farms concerned with livestock production. This information is shown in table 17. It is difficult to interpret accurately the exact kind of machine from the class headings. However, machines of the classes defined are becoming more numerous on collective and state farms. In the case of milking machine units, one would presume this means a vacuum pump, the necessary lines, and one to several buckets. With a total of 21,000 in 1957, this would suggest perhaps one-third of the 66,000 collective and state farms have milking machines. Perhaps a higher proportion have sheep-shearing units although it is probable that fewer collective and state farms keep sheep than keep cows. Choppers for silage, straw, grain, and oil cake (presumably feed grinders) are considerably more numerous, as are also steamers for fodder.

Statistics of acreages devoted to the production of important forage crops and silage are summarized in table 18. Actions taken by the

TABLE 15.—*Numbers of sheep of the fine wool breeds and production of fine wools on collective and state farms* [1]

Item	1940	1953	1957
Number of sheep, million	3.0	6.8	14.1
Yield of fine wool, thousand tons	159	310	728
Yield of fine wool per head, pounds	11.7	10.0	11.4

[1] From table on page 227 of A Statistical Summary, U.S.S.R. In Figures, Central Statistical Department, Ministry of Agriculture, Moscow 1958.

TABLE 16.—*Relative percentage in the production of various classes of wool, by years* [1]

Class of wool	1932	1940	1953	1956	1957
Fine wool	6	12	14	22	27
Semifine wool	------	------	16	18	19
Semicoarse wool	5	35	26	29	26
Coarse wool	89	53	44	31	38

[1] From table on page 227 of A Statistical Summary, U.S.S.R. In Figures, Central Statistical Department, Ministry of Agriculture, Moscow, 1958.

TABLE 17.—*Machines on collective and state farms used for livestock production* [1]

Class of machine	1934	1941	1954	1957
	Thousands	*Thousands*	*Thousands*	*Thousands*
Silage and straw cutters	230	189	199	201
Grain choppers and oil cake choppers, etc.	------	31	42	52
Fodder steamers	6	20	81	138
Automotive steamers	------	------	955	3123
Milking machine units	------	------	8	21
Sheep shearing units	------	------	17	29

[1] From table on page 228 of A Statistical Summary, U.S.S.R. In Figures. Central Statistical Department, Ministry of Agriculture, Moscow, 1958.

TABLE 18.—*Fodder production in the U.S.S.R. by years*[1]

Item	1928	1940	1953	1957	
				All crops	Corn
Fodder cultivation, million acres:					
From barley, oats and corn	71.4	86.7	70.2	71.6	14.3
From fruit and vegetable cultivation	0.7	2.5	4.2	3.2	
For silage	0	2.0	5.7	22.2	16.0
From sown grass for hay and green fodder	8.9	40.3	61.0	86.7	14.8
From natural meadow for hay	126.2	146.2	167.0	131.6	
Production of silage, million tons[2]		17.6	32.0	90.6	52.7
Production of silage, tons per cow[2]		2.7	3.2	7.0	4.1

[1] From table on page 224–25 of A Statistical Summary, U.S.S.R. In Figures, Central Statistical Department, Ministry of Agriculture, Moscow, 1958.
[2] On state and collective farms.

central government in 1953 apparently provided for, and directed that the production of forage for livestock feeding be materially increased on collective and state farms. The area devoted to silage production is reported to have increased 3.9 times or by 17.3 million acres and the area in annual and perennial grass for hay and green feed by 42 percent or 25.7 million acres. The total area devoted to corn grain and green corn fodder and corn silage amounted to 44.2 million acres in 1957, or 5.2 times that in 1953. Silage production increased in that time by 58.6 million tons, or by 2.8 times. The report further shows that on collective and state farms about 7 tons of silage per cow were stored in 1957 compared to 3.2 tons in 1953. It is quite obvious that major emphasis is being given to the expansion of the forage supply, both green feed for use in place of pasture in summer and silage and hay for feed in the winter, to support an expanding livestock economy.

The study group was not completely satisfied with all of the statistical information that was made available. It appears that statistical reporting and analysis were not as well developed and as uniform in the gathering and reporting of data relating to agriculture and livestock production as in the United States.

The study group had an unusual opportunity to interview the Minister of Agriculture of the Latvian Republic and the Vice Minister of Agriculture of the Ukrainian Republic. Accounts of these interviews in which statistics and related information were given are included in the appendix of the report.

Account of a Meeting With Latvian Minister of Agriculture

The animal husbandry technical study group was the first of the Cultural Exchange American Delegations to visit the Latvian Republic. Minister Nichalovia greeted the group and he and his representatives did all possible to make their short stay interesting, profitable, and pleasant.

The Latvian Republic has a population of more than 2 million. It has about 16 million acres of land. Of this, about 5 million acres are under plow, 2.5 million are in meadow, 6.3 million in forest, and 1.3 million in bogs, with the remainder in lakes, rivers, and ponds. Considerable effort is being made to reclaim and bring into cultivation additional land now in bogs, etc. The soil is sandy and sandy loam with considerable areas of peat intermixed. The topography is rolling and the landscape is most attractive. The climate is mild due to the closeness to the Gulf of Finland. Annual precipitation averages about 23.6 inches, distributed so that sufficient moisture is available during the growing season.

Latvia has 1,200 collective and 143 state farms, the former encompassing 76½ percent of the land and the latter, 18 percent. The remainder is in private holdings, cities, and towns. The major enterprises are cattle and pig production and the growing of feeds to support them. The principal feeds are grass and clover for pasture, hay, and silage. They are grown on 36 percent of the plowed land. Vegetables and fruits are major food crops and flax and sugar beets are grown on fairly large acre-

ages. There are three sugar factories in the republic. The Minister stated that wheat was not an important crop since it can be grown elsewhere and shipped in to better advantage.

Historically, most of the exports, consisting mainly of butter and bacon, found markets in Western European countries. Since the incorporation of the republic into the U.S.S.R., these exports now go east to Moscow and other Russian cities. The Minister compared prewar and postwar conditions, stating that the farm people were better off now than before the war. Since collectivization of farming, prices are stabilized and are the same for the whole republic. This was not the case before 1954 when collectivization occurred in a big way. Prices received by individuals for produce from their own little plots of land are the same as those from the collective and state farms.

Cattle raising is the most important activity. There are about 500,000 cows (estimate 0.8 to 1 million total cattle) and most of these are the Latvian Brown breed. (This is an average of 375 cows per farm, not considering those owned by individuals.)

The average production per cow is 5,510 pounds of 4-percent milk. Most of the production beyond that for fluid milk used in the cities is made into butter. The skim milk is used on the farms for animal feed. The price received per quart of milk on the average is 13 cents in summer and 14 cents in winter. Prices are set on the basis of butterfat test with a differential favoring high butterfat content. Efforts are being made to increase the test of the milk supply. Costs of production run about 7 to 12 cents per quart, and feed represents about 52 percent of the cost. For the republic, average yield per acre is 430 pounds of milk.

Considerable emphasis is placed on record of performance and they have underway a well defined record of performance program with about 80 percent of all the cows in the republic enrolled. A total of 800 people from the Ministry and 950 farm people are engaged in conducting the performance testing work.

Beef comes from the same cattle and the average yield of meat per acre was about 60 pounds in 1958 and will be about 84 in 1959. Special attention is given to meat qualities as well as milk when selecting animals for breeding purposes. Efforts to increase meat production take form by raising male calves, without castration, to older ages after which they are fattened for slaughter at 500 pounds live weight.

Pork production centers around cured bacon and ham. Producers are paid according to the quality of the carcass for bacon. Considerable effort is made in breeding and feeding hogs, which are mainly the Large White breed, to improve meat type and bacon quality.

The Minister stated that the Latvian Agricultural Academy has 9 faculties and 21 technical schools. The Ministry of Agriculture also operates the following research institutes: Animal Husbandry, Veterinary, Soil Science, and Land Drainage and Irrigation. Each institute operates one or more experiment station farms. The Academy and other institutes were reported to have trained 12,000 specialists, 10,000 who are directly serving agriculture and the remaining 2,000 in related activities. The various educational institutes regularly give several types of extension short courses and seminars, particularly during the winter, for members of farms. These are used a great deal by the collective and state farm people. There is an active program of demonstrational work on collective and state farms.

In each region of Latvia, the Ministry maintains a staff of 12 specialists, including agronomists, zootechnicians, veterinary officers, economists, etc. In addition, each collective and state farm has at least one agronomist and a zootechnician whose job is to lend technical supervision to the farming program. There are about 6,000 of these specialists, most of whom are graduates of one of the educational institutions. More than 80 percent of the zootechnicians are women. The head of the Animal Husbandry Section of the Ministry of Agriculture is a woman.

It was the opinion of the study group that the activities of the Latvian Ministry of Agriculture were well organized and competently staffed, and that the programs of research, education, and extension were about as good as any that were observed in the U.S.S.R.

Account of a Meeting With Ukrainian Vice Minister of Agriculture

The Vice Minister, Mr. Zorin, greeted the animal husbandry study group in behalf of M. S. Spivak, the Minister, who was in Moscow at the time. He reviewed for them the agriculture, and particularly the animal husbandry, of the Ukrainian Republic in the manner herein recorded.

The Ukraine is the breadbasket of the Soviet Union and is the most important republic in livestock and grain growing. The Ukraine produces 70 percent of the wheat, corn, sugar beets and sunflowers, and 25 percent of all the meat and milk. The Ukraine is divided into three regions by reason of climate and soil differences, the North-Northeast, the Middle, and the South. The rainfall for the three regions averages 23.6 inches for the North-Northeast, 19.7

inches for the Middle, and 14.2 inches for the South. In the North-Northeast the soil is rather sandy, in the Middle and South it ranges to black clay and heavy black clay. The soil, especially in the Middle and South, is very fertile but moisture is limited.

There are 106,210,000 acres of land under cultivation and 84,000,000 of this under plow. There are 11,032 collective farms averaging 8,400 acres and 880 state farms averaging 13,350 acres in size. The livestock population consists of 16,000,000 head of cattle, of which 7,000,000 are cows, 16,000,000 pigs, 11,000,000 sheep, and about 70,000,000 chickens. The cows are mainly dual purpose with emphasis on milk production. For every 100 acres the animal population is 91 cattle (45 cows), 89 pigs, 62 sheep, and 630 poultry. The Vice Minister stated that the livestock population was almost completely destroyed during the war and that restoration was assisted by animals sent from other republics.

The major breeds of cattle are the Simmental, 30 percent of the total, which are mainly in the middle region; Red Steppe, 37 percent of the total, mainly in the south; and Ukrainian Steppe, 7 percent of the total, in the northnortheast. Minor breeds include Lebedin, Grey Ukraine, Brown Carpathian, Red Polled and Black and White. These make up most of the remaining 26 percent of the cattle.

The average yield of milk per cow on collective farms was 4,620 pounds and for state farms 5,280 pounds in 1958. Cows are milked three times per day. Cattle provide 42 percent of the meat produced in the Ukraine.

The five major breeds of pigs are the Large White (meat and bacon type), Mirgorod, Krolevetz, White Steppe Ukraine (developed by academician Dr. Ivanov), and Spotted Ukraine (developed by academician Grebin). Fifty percent of the meat produced in the Ukraine comes from pigs.

The principal breeds of sheep are: Askaniya, Precose, Tsgai, Soviet Merino, Karakul, and Sokil. For the Ukraine, the yield of wool per sheep is 6.2 pounds and per 100 acres is 119 pounds. Some sheep were reported to yield fleeces as large as 51 to 55 pounds. Breeds include fine wool, coarse wool, black or grey Karakul wool. Mutton makes up 4 percent of the meat produced in the Ukraine.

The Vice Minister stated that there were about 10 breeds of chickens in the Ukraine but did not enumerate them, nor did he give statistics on egg production. He did indicate that of the total meat production, from 4 to 5 percent comes from poultry. This probably includes meat from ducks and geese, of which large numbers are raised.

The Ukrainian Republic has five institutes dealing with animal husbandry research (the study group visited four). In addition, there are 22 complex regional stations within the Animal Husbandry Section of the Ministry, 22 agricultural colleges to prepare technicians for careers in agriculture, and 120 technical agricultural vocational schools. Each of these schools maintains an experiment station. Students come to these technical schools after eighth grade and take a 4-year course after which they spend 5 years on collective farms as apprentices.

There are 70 pedigree increase farms in the Ukraine, 32 of them for cattle, 13 for horses, 14 for swine, 7 for sheep, and 4 for poultry. Their objective is to improve the productivity and uniformity of existing breeds and to develop new breeds and strains. They also produce seed stock for distribution to other farms. These are the best farms and most of them are state farms. In addition, 2,400 farms are used to further increase the improved stock provided by these pedigree farms. Half of these are for cattle and the remainder mainly for pigs and sheep.

Artificial insemination is used by these farms and the stations and institutes in this increase work. There are 350 artificial insemination stations in this republic. At one of these stations a Dr. Smernov first successfully held semen in frozen storage, later used it to inseminate a cow to produce a live calf. The Vice Minister reported that in 1959 the objective was to inseminate a total of 4.6 million cows, 3.6 million sheep, or about 60 percent of the cattle and 62 percent of the sheep. Use of artificial insemination in swine is beginning. Plans are to inseminate 20,000 sows during the breeding season this fall. Considerable research is underway to improve the technique with swine, and he reports good progress is being made.

In 1957-58 the birth rate of inseminated cows was 93 per 100 cows. Seventy-six settled on first service and only six in 100 had to be inseminated as many as three times. This is the result of a sample of 3 million cows. The average is 770 cows per bull. Other research deals with developing ways of holding semen at room temperature. They have been able to hold semen 6 to 7 days at room temperature with good results.

The Vice Minister indicated that the Ministry was beginning to consider the development of more specialized beef cattle production. They have introduced, for the purpose of using in crossing on existing breeds of cattle, bulls of the Beef Shorthorn, Aberdeen Angus, Santa Gertrudis, Zebu, and Hereford breeds. Specimens of these breeds were later observed at

the institutes visited, especially at the Askaniya Nova Research Institute.

Descriptions of Collective and State Farms as Related to the Animal Husbandry Study Group by the Chairman

Red Partisan Collective Farm—Near Leningrad

The Red Partisan Collective Farm is one of 437 collective and 110 state farms in the Leningrad Department. The farm was organized in 1948 in an area known as Bowing Hill because on this site the Swedish invaders surrendered to Peter the Great in the War of Liberation. During World War II the German armies occupied the area. Following their departure, almost all of the buildings had to be rebuilt and the fields and cropping plans reorganized.

When first organized, the collective included 16 members; present membership is 400. The 5,434 acres were given to the membership by the government for eternal ownership for $50,000. The enterprises include cattle, pigs, poultry, grain, vegetable, and orchard production. Cattle raising for milk is the main enterprise.

The Chairman of the farm is Mr. M. T. Petranin. Technical assistants include a zootechnician, a veterinarian, an agronomist, and a horticulturist. The Chairman and an elected committee of eight members, with the advice of the technicians, make the plans and set the standards of performance for the different categories of work. The Chairman has a veto power over the committee, who arrive at their recommendations by secret ballot. The recommendations of the Ministry of Agriculture, however, must be followed and the government has first call on production in meeting the farm's set quota for the different products. The farm has a history of more than meeting its set production goals.

In 1958 the income was $400,000. Fifty thousand dollars was used for taxes and insurance. Of the $350,000 remaining, $200,000 was used for labor, $50,000 for operating supplies, and $100,000 was used for capital improvement and upkeep of buildings and machinery. The collective invests money in the State Bank and earns 2½ percent interest on it.

The work force is divided into brigades with a leader and an assistant at the head of each. Brigades include dairy, piggery, poultry, greenhouse, vegetable growing, forage growing, grain growing, potato growing, fruit growing, management, construction maintenance, and tractor and machine operation.

The Chairman's salary was given as $120 per month, plus a bonus of $40 per $100,000 income for the farm per year. Specialists' salaries are 70 percent of that of the Chairman. Brigade leaders receive $60 per month plus a bonus of $40 per $100,000 farm income. Tractor brigade leaders receive $80 per month, plus $1 per day for each machine if all complete their assignment. The ordinary working force receives income according to their effort and production, beyond certain set norms, which norms are set once each year. For instance, a worker in the dairy (dairy workers are the highest paid group) earns about $80 to $100 per month. Their pay is based on the rate of 0.09 cents per liter of milk produced. Workers in crop production make $40 to $50 per month.

All workers who fill their job requirements receive a 2-week paid vacation. The Chairman, specialists, and brigade leaders get 4-week paid vacations. Workers retiring at age 65 receive a pension of $10 to $20 per month, depending on the extent of their contribution, paid in while working. Maternity benefits are given, which include $20 and an average salary while on leave for 2 months.

Each family in the collective has its own home and 0.6 acres of land which is its own. The family may keep one cow or pigs and chickens and grow garden, orchard, and feed crops. What is not needed for the family may be sold to the government or on the open market.

The dairy enterprise consists of 700 head, 300 of which are milk cows. In 1958 the farm produced 2,200,000 pounds of milk, of which one-half was delivered to the government and the other half was sold to the government or on the open market, whichever gave the best price. The cows in this herd for the most part were black and white of what was said to be the Swedish breed. They looked like grade Holsteins. The 1959 average production was given as about 8,500 pounds with an average test of 3.72 percent butterfat. The milk cows were barn-fed green feed and supplemented with concentrates. The cows were in good shape, were well cared for, and appeared clean and healthy. Artificial insemination was the method of breeding used. Cows were milked three times daily by machine, and the yield of milk was measured in a measuring bucket and recorded at each milking. Butterfat determinations were made by a farm technician twice each month.

The farm raises 1,000 pigs a year. The pigs are fed mainly on city garbage cooked with potatoes, pumpkins, green forage, and a concentrate mixture. The pigs are the Swedish Landrace and Large White breeds and their crosses with a local breed called Breitov. The

pigs did not appear to be as well housed or taken care of as were the cattle. Pigs are marketed at about 9 months of age, and they weigh 190 to 200 pounds.

Both pigs and cattle are marketed at a large packing plant near Leningrad. Prices of pigs depend on weight, but a bacon-type hog brings the highest price. Cattle are sold on the grade basis of high, medium, and low, based on live weight and appearance. About 220,000 pounds of meat (beef and pork) were sold from the farm in 1958.

The farm maintained 2,000 laying hens of the Russian White breed. No data were given on production. More than 2,000 tons of potatoes and vegetables were grown and sold mostly to their own members. The Chairman proudly stated that the farm owned 9 tractors and 15 trucks.

Red Herdsman State Farm—Near Askaniya Nova

This state farm, one of 880 state and 11,032 collective farms, is on the shore of an arm of the Black Sea in the semi-arid Steppe region in the South of the Ukrainian Republic. The rainfall here is 12 to 14 inches. The main enterprise is sheep raising, and it is a pedigree station used mainly to increase the Askaniya Nova Experiment Station breeding stock. The Chairman of this farm is Mr. G. N. Egrov and the chief sheep specialist is Mr. Tolmachov. The farm consists of 68,000 acres. About 25 percent of the land is in salt spots and not usable. This state farm receives no subsidy from the government and operates on its income, which amounts to about $300,000 a year.

While sheep breeding is the main activity, pigs, cattle, horses, and chickens are also raised. The population of sheep is 30,500; cattle, 2,400; pigs, 2,500; horses, 2,500; and poultry, 20,000. While crops such as wheat, sugar beets, and watermelons are grown, the main crop production is feed grain and forage to feed the livestock population. Feed grain crops occupy an area of about 32,000 acres; alfalfa, 4,800 acres; sudan grass, 3,700 acres; and other crops in lesser acreages. Silage is made from corn, sorghum, and rye. Corn yields run 20 to 25 tons of fodder for silage per acre. Wheat yields average 1,800 to 2,350 pounds per acre. The Chairman stated that it costs 5 cents to produce 100 pounds of wheat, which is less than in most other areas of the country.

This farm is divided into five units, each headed by a manager with a higher education. The work force is organized in brigades under each of these managers. All of the machinery and the shops for repairs, etc., are in a central unit. The average work week is 46 hours (5 days of 8 hours and 6 hours on Saturday). The average worker makes about $110 per month, paid in cash. The pay is according to the amount produced and, if more is produced than the goal set for the worker, the pay is increased accordingly. The following examples were given for leading workers: (1) A dairy maid who supervised the work of the others who take care of about 200 head, in addition to caring for 14 cows, obtained an average of 13,200 pounds of milk per cow; (2) a chief brigade sheep herder who supervised four other men caring for 650 head, and in addition looked after 100 ewes and obtained from them 120 lambs and an average wool yield of 15.4 pounds of wool. This man was proclaimed the champion sheep herder and was so recognized by an award of a gold star medal by the Ministry of Agriculture at the Moscow Exhibition annual awards ceremony.

Only the sheep-raising operation was studied in some detail. The sheep were the Askaniya breed and the breeding and increase work here is to improve and extend the use of the breed through the development of breeding stock for use in artificial insemination and on other collective and state farms. They follow breeding procedures laid down by the Askaniya Nova Experiment Station and largely developed by the geneticist Ivanov. Line breeding and intensive selection are used. Animals in each line are selected according to three classes: elite, first class, and second class. Selection is based on size, wool yield, appearance, and fertility. These various classes within lines are crossed with those of other lines in an effort to increase performance. High performance animals are then selected for breeding purposes. Animals selected out as not good enough for breeding purposes are culled.

The sheep are maintained in a number of small bands, 600 to 650 head each, and are kept on the range as selected groups on various parts of the farm. The range is not very productive and the ration of the animals is supplemented daily with alfalfa or green feed and some concentrates. In winter (December 1 to February 1) ewes are fed about 4.5 pounds of alfalfa hay, 3.5 pounds of silage, some green feed, if available, and ½ pound of grain per head per day. In the last stages of pregnancy and during lactation, the grain is increased to about 1 pound daily. Ewes are bred to lamb in February and lambs are weaned at 4 months of age. The average wool yield for the farm is 14.7 pounds per head but many exceed this average. One ram was reported to have yielded 17 pounds at a weight of about 300 pounds. They like to have their yearling lambs that are

selected for breeding animals weigh 200 pounds and yield 26 pounds of wool.

This state farm operates an artificial insemination station for sheep and cattle. In addition to breeding on the farm last year, 40,000 sheep and 4,500 cows were serviced from this station.

Land of the Soviets Collective Farm—Near Rubtsovsk

This farm is under the chairmanship of Mr. M. N. Bukhanko. It is a diversified farm in the new lands area of Central Siberia, several hundred miles south and west of Novosibirsk and lying west of the Altai Mountains. It is an old collective farm, organized in 1927, and it encompasses four villages where 422 families with a population of 2,500 live. The farm contains 33,700 acres of which 26,680 acres are under plow. Since 1954, 7,700 acres of virgin land have been brought into production. Cattle, sheep, pigs, and poultry raising are major enterprises, along with wheat and sugar beet production. Wheat is grown on 11,440 acres and the average yield of grain is 2,050 pounds per acre. Sugar beets occupy 1,177 acres and the yield is 16,610 pounds per acre. Corn is grown on 3,300 acres for forage and averages 26,564 pounds per acre. Pasture is used only for sheep and young cattle. Cows are fed green forage in barns, including alfalfa, sudan grass, millet, green corn, oats and vetch, broomgrass, etc. Hay, straw, and corn silage provide winter forage.

The average rainfall in the area is 14 to 15.7 inches. Average rainfall in May is 1 inch; June, 1 inch; July, 2 inches; August, 2 inches; and September, 1 inch, providing good moisture throughout the short growing season. The soil is light sandy loam and there appeared to be a considerable area of salt patches.

The farm has 15 wheel tractors, 20 caterpillar tractors, 24 combines, 21 windrowers, 22 five-bottom plows and other necessary machinery. This machinery was recently acquired from the State Machine Control Station.

The income from this farm in 1958 was $1,350,000—$730,000 from crops and $620,000 from livestock. The wheat, sugar beets, and other cash crops are sold to the government. In Rubtsovsk there is a government slaughterhouse where the meat animals are sold for slaughter and a creamery where the milk is sold for butter making. Meat used on the farm is slaughtered and processed in a small abattoir on the farm.

There is a labor union on this collective. The work force is organized in brigades according to kinds of work. Technical specialists in livestock and crops are on the staff.

The average worker earns 433 labor units per year. A labor unit is $1.80. Seventy-five percent of the families earned more than 1,000 labor units in 1958. Three or four members of each family work at least part time. The labor unit income for the average family averages about 1,100, or a family income of $1,980.

Each family has its own home and 1¼ acres of land. From this, family needs for food are largely met and sales of excess produce add to the family income. The owner is privileged to own as many as 10 sheep, or 2 pigs or a cow and a few poultry on his private holding.

Dairying is an important enterprise. The herd consists of 1,940 head of cattle, 576 cows in milk. They are mainly of the Simmental, white-faced Ukraine, and mixed breeding. The average yield is 5,856 pounds. Milk is separated, the cream sold, and the skim milk fed to calves, pigs, and chickens. The beef production comes from these same cattle. The cattle were well fed and cared for.

The sheep population is 11,400 head of the fine wool Altai breed. Average wool yield is 15.6 pounds per head (average based on 6,500 sheep). The sheep were good size, uniform in appearance, and looked well fed and cared for.

The pig population is 3,200 of the Large White breed. Two litters are farrowed per year and 1,000 pigs are fattened for market each year. The champion pig raiser of the region, a woman, is in charge of the pig project. She won her acclaim for raising 33 pigs from one sow in 1 year. The pig project on this farm looked good and the pigs were good type. Skim milk, grains, potatoes, pumpkins and forage cooked and made into a slop was the usual method of feeding.

The farm has a population of 18,000 birds, 5,000 of which are laying hens. The average rate of lay the first 5 months of 1959 was 97 eggs. As on most collective farms, large numbers of ducks and geese are raised.

This collective farm appeared to be a pioneer in this Altai region, known as the new lands area. The Vice Governor of the Barnaul Department, in which this farm is located, was host to the group. He stated that the area was under intensive development. The area consists of 867,056 square miles. There are only 14½ million acres under cultivation, more than 11 million in spring wheat. Wheat harvest was in progress while the group was there. The harvest looked good and the wheat grains were full and well matured.

The corn observed in this area was strictly forage corn and showed very good growth and evidence of producing large yields of fodder. It was thickly sown and had very few ears on it. Good stands of sugar beets were also observed in this far north area.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1961—593923